3510-20-30 Practicum in Journalism, I, II, III (1, 1, 1) Supervised experience in newspapering and writing. Prereq: 2220.

3560 Investigative and Specialized Reporting (3) Investigative and interpretive reporting of complex or specialized subjects to place news in perspective or to clarify situations. Emphasis on writing for publication. Prereq: 2220.

3710 Public Relations (3) Principles and techniques of public relations. Overview of PR as a management tool of business, government, institutions, and organizations.

3720 Public Relations: Advanced (3) Publicity organization, techniques and tools. Preparation of communications materials to gain support from target publics. Prereq: 3710.

3730 Public Relations Cases (3) Case studies and application of public relations principles to problems in business and industry, government, institutions, organizations, trades and professions. Prereq: 3720.

3810 Specialized Publications (3) Case studies and application of public relations principles to special problems in business and industry, government, institutions, organizations, trades and professions. Prereq: 2220 or consent of instructor.

3910 Basic Photography (3) Principles, policies, and procedures of using pictures as an editorial medium. Press and reflex cameras and flash photography. Darkroom techniques in developing, enlarging, printing. 1 hr and 2 labs. Prereq: Consent of instructor.

4130 Editorial Writing (3) Analysis of editorial policies, practices, pages. Writing of editorials, columns, paragraphs, and interpretative articles. Prereq: Senior standing.

4310 Reporting Public Affairs (3) Reporting news of courts, politics, government, finance, labor, and social agencies. 2 hrs and 1 lab. Prereq: 2220 and senior standing.


4420 Newspaper Management (3) Daily and weekly newspaper management. Developments in newspaper management.

4510-20-30 Practicum in Journalism, IV, V, VI (1, 1, 1) Supervised experience in news writing and editing. Prereq: Senior standing or consent of instructor.

4810 Journalism in the High School (3) Functions and methods of publications. Staff organization, writing and editing techniques, editorial problems, and business management.

4910 News and Feature Photography (3) Advanced principles and methods in black-and-white photography. Emphasis on news and feature photographs and picture stories. Prereq: 3910 or permission of instructor.

4950 International Communications (3) Communication of news and opinion among nations and under varying types of political and economic systems: world news organizations; the press as a factor in international affairs; barriers to the flow of information; comparison of world press systems.

4990 Problems in Research (3) Independent work course for seniors. Intensive study of some phase of the major field; investigative procedures, report writing.

GRADUATE

5210 Government and the Press (3)

5250 Public Opinion and Mass Media (3)

5510-20-30 Writing and Editing Projects (3, 3, 3)

5560 Magazine Article Writing (3)

5710 Studies in Public Relations Communications (3)

5810 Magazine Editing and Production (3)

5950 Communications and International Development (3)

5970 Independent Study (3)
Division of Continuing Education, Knoxville

Joseph P Goddard, Dean
William D. Barton, Associate Dean

The Division of Continuing Education at Knoxville extends the academic programs and services for all colleges and schools on campus to the people in the area served by The University of Tennessee, Knoxville. In addition, the Division cooperates with all other campuses of The University of Tennessee in extending academic programs and services to all citizens of the state.

Conferences and Institutes

Director:
F.A. Thurman, B.A. Tennessee.
Associate Director:
R.H. Rader, M.S. Tennessee.
Assistant Director:

The purpose of the continuing education conference program is to bring together under University auspices groups of participants and qualified resource people to share new information and ideas, to develop new insights, to cope with current problems, or to impart new work performance skills. Types of persons served are practically unlimited. This includes all disciplines: the professional, technical, managerial, and service individuals from the professions, industry, government, education, and commerce.

Conferences, institutes, short courses and workshops from one day to two weeks or more in length are planned and administered by this department and the related academic departments in cooperation with business, industrial, and professional organizations.

Each program is specifically designed for the needs of the group being served and may be held on the University campus or at any other location where adequate facilities and sufficient interest exist.

Workshops and Off-Campus Programs

Director:
Assistant Directors:

This department conducts undergraduate and graduate courses in many locations away from the Knoxville campus. The courses are scheduled in response to requests and identifiable needs of adult part-time students who live some distance from the UTK campus and who take part or all their courses at off-campus locations.

All course offerings and instructors are approved by the appropriate academic department heads and the credit awarded is resident credit. The majority of the colleges and their academic departments cooperate in the off-campus program.

Credit workshops are another phase of continuing education designed to meet the student’s changing needs. They are coordinated through the various academic units of the University and provide students the opportunity to participate in short periods of intensive study. As a result, students may earn college credit within a shorter time frame than the traditional quarter system.

Workshops also offer flexibility of timing, location and content. Summer workshops are particularly popular with teachers and school administrators. Although most workshops are held on the UTK campus, geography is not a limiting factor. In the past, workshops have been held throughout the state and in the United Kingdom.

University Evening School (Knoxville and Oak Ridge)

Director:
Assistant Director:
J.C. Sekula, Ph.D. Tennessee.
Coordinator, Student Services:
L.U. Jurand-Salter, M.S. Tennessee.
Assistant Professors (full-time only):
G.M. Fisher, M.S. Tennessee; C.B. Mamantov, B.S. Louisiana State.
Instructor (full-time only):
A.J. MacCabe, M.S. SUNY at Albany.

The University Evening School with the cooperation of academic colleges and departments administers credit classes and supports activities for those students attending in the late afternoon and evening. Programs and services are offered enabling working adults to pursue their educational interests and goals.

Undergraduate Degree Programs

The following degrees are available for evening students:
College of Business Administration
Bachelor of Science in Business Administration with a major in Accounting, General Business, Economics, or Office Administration;
College of Engineering
Bachelor of Science in Engineering Science;
College of Liberal Arts
Bachelor of Arts with a major in Anthropology, Economics, History, Political Science, Psychology, or Sociology.

Graduate Degree Programs

Some departments within the Colleges of Business Administration, Education, and Engineering offer all courses required
for an advanced degree during the evening. For a specific major, consult the appropriate department in the College of Business Administration, all courses required for the MBA degree with a concentration in industrial management are offered during the evening.

Nursing Education Program

The Nursing Education Program is conducted through contractual agreement with three area Knoxville hospitals. The diploma program is run through each hospital's independent School of Nursing. Academic courses are provided by the University Evening School in support of this program.

Oak Ridge Center

The University Evening School operates a center in Oak Ridge, Tennessee, providing undergraduate and graduate courses through the joint cooperation of the Colleges of Business, Education, and Liberal Arts. Information concerning this program is available from the Office of the University Evening School (at Oak Ridge), Providence Road, Oak Ridge, Tennessee 37830.

Student Services

A comprehensive program of services is provided by the Evening School for the adult part-time student.

REGISTRATION

Quarterly registration by mail or on campus is offered as a convenience for former Evening School students.

ADVISING

An advising-counseling program is available for the benefit of all evening students who need assistance with academic and/or personal matters. This program can accommodate students during regular daytime hours (8:30-5:30) and in the evenings by appointment. In addition, advisors from the various colleges are on hand for academic consultation during evening preregistration days. A full-time veteran adviser assists evening students, who receive educational benefits under the G.I. Bill, with their academic planning.

FINANCIAL AID

Evening School students who encounter difficulty in pursuing academic goals because of financial restrictions may be eligible for assistance through the Evening School Scholarship Fund. In addition, interested students may obtain applications for the Basic Educational Opportunity Grant Program in the Evening School Office.

Elderly and Disabled Persons

Recent statewide legislation gives Tennessee citizens who are 60 years of age or older, or those who are totally disabled, the opportunity to attend courses at the University at no charge on an audit, space available basis. Legal verification of either of these conditions is required for enrollment. Students who are 65 or over, or are totally disabled and who desire to receive UT credit for their courses, may pay a reduced charge of $5 per credit hour to a maximum of $50 per a full-time load. Registration for day and evening classes is handled by the Evening School.

For additional information concerning any of these programs or services please contact the University Evening School, 451 Communications & University Extension Building.

Non-Credit Programs

Director:

Assistant Director:

The department conducts and coordinates various non-credit courses offered on campus and off campus. It administers non-credit programs offered by the department and other courses offered in cooperation with other academic departments and service departments of the University. These non-credit courses provide opportunities for college remedial training, In-service training, upgrading of physical and some technical skills, reentry training, and leisure type educational courses for the Knoxville and surrounding community.

Certain non-credit courses are approved for Veterans' training. For specific information, contact the Department of Non-Credit Programs.

Continuing Education Units (CEUs) are awarded to students satisfactorily completing courses described in the non-credit quarterly class schedule. A Continuing Education Unit is defined by the Southern Association of Colleges and Schools as "ten contact hours of participation in an organized continuing education experience under responsible sponsorship, capable direction and qualified instruction." A permanent record of CEUs is maintained by the Division of Continuing Education, Department of Non-Credit Programs. A transcript of all CEUs earned at The University of Tennessee may be obtained upon written request.
Teacher education is historically a major function of The University of Tennessee. Beginning in 1903, when the first courses for teachers were offered, the University has increasingly fulfilled its responsibility to provide schools with competent teachers and service personnel and to improve the teaching profession by continually upgrading its membership. The College of Education was established in 1926, and all teacher preparation programs at The University of Tennessee are now coordinated within its seven departments and its School of Health, Physical Education, and Recreation.

The College of Education holds membership in the American Association of Colleges for Teacher Education. All certification and degree programs through the doctoral level are fully accredited by the National Council for Accreditation of Teacher Education, the Southern Association of Colleges and Schools, and the Tennessee State Department of Education.

The faculty of the College of Education is committed to performing three major functions: (1) to provide professional preparation for teachers, administrators, and school service personnel at undergraduate and graduate levels; (2) to collaborate with school personnel, educational agencies, professional groups, and others interested in the evaluation and improvement of educational opportunities, programs, and services; and (3) to promote and conduct experimental and research studies in education.

The teacher preparation programs represent utilization of University-wide resources and cooperation of all appropriate units. Certain requirements are of basic importance: a broad cultural background in the arts and sciences (general education), mastery of professional knowledge and skills, and thorough preparation in specific teaching fields. Through a carefully planned program of combined academic and direct experiences, the prospective teacher acquires a depth and breadth of knowledge and understanding superior to that of the typical college graduate—superior in cultural and citizenship appreciation as well as in professional and scholarly accomplishment.

The Claxton Education Building contains many modern and functional facilities for the professional training of teachers. Classrooms, laboratories, seminar rooms, faculty and administrative offices, the instructional materials center, the Bureau of Educational Research and Service, the School Planning Laboratory, and facilities for special activities such as observation and experimentation are located in this air-conditioned building.

Special Services

Bureau of Educational Research and Service. Four major types of activities—research, development, educational services, and publications—are channeled through the Bureau of Educational Research and Service (BERS), located in Claxton Education Building. The research activities involve developing research proposals, conducting research, and assisting others in development of research proposals in the College of Education. Developmental activities relate to change efforts in curricular content and instructional methodology. Educational services include a wide list of activities such as inservice educational programs, consultant services, educational services and administrative training programs. Official publications of the College of Education are developed through the Bureau. A limited number of graduate student assistantships are available. The Educational Opportunities Planning Center, the Research Coordinating Unit, and the School Planning Laboratory are integral parts of the Bureau of Educational Research and Service.

EDUCATIONAL OPPORTUNITIES PLANNING CENTER

The Educational Opportunities Planning Center (EOPC) works with school districts in the Tennessee-Kentucky area to help meet their desegregation-related needs by assisting with needs assessment and by helping develop plans to meet the needs. A new component was added during the 1975-76 year to deal with sex discrimination in the school systems of Tennessee and Kentucky. Staff follow through with inservice training of local district personnel, with such training directed toward solutions of curricular, human relations, and other types of problems created or compounded by school desegregation and sex discrimination. On-site evaluation of locally installed practices and continuing cooperative evaluation of the progress of local programs are additional major efforts. This program is funded by the U.S. Office of Education.

SCHOOL PLANNING LABORATORY

The School Planning Laboratory (SPL), located in Claxton Education Building, assists school systems and colleges in the state and in the southeastern region with problems arising from renovation of existing facilities and planning of new facilities. Course work peculiar to the field of school planning is offered through the Department of Educational Administration and Supervision. Graduate student assistantships are available each year through the Laboratory.

The Reading Center. A commitment to the concept of teaching, research, and service as the role of the University involves the Reading Center in a variety of activities. An extensive program of diagnostic and remedial reading services to children is closely tied to graduate course work and practicums in reading
methodology. Effective reading and study classes are offered for the benefit of the University student body. Service functions of the Center include extensive inservice and consultant services for public school reading program improvement. The Center also maintains a remedial reading materials center and assists in the coordination of an ERIC/CRIER Regional Information Center in reading. For further information write the Director, Reading Center, 1912 Terrace Avenue, Knoxville, Tennessee 37916.

Teacher Placement Service. The College of Education, cooperating with the University Placement Service, assists qualified students and alumni in securing positions. School and college administrators are cordially invited to make full use of the services in their efforts to employ competent personnel.

General Information

Admission to the College

For transfer into the College of Education after completion of the freshman year, a minimum grade average of 2.0 (C) is required.

Course Load—Permission for more than 19 hours in a quarter must be obtained from the Associate Dean for Undergraduate Programs. A normal course load in the College is 16-18 hours.

Admission to Teacher Education

All students who desire teacher certification, whether enrolled in the College of Education or other colleges, are required to apply for admission to the Teacher Education Program. Formal application for admission to the Teacher Education Program should be made during the second or third quarter of the sophomore year. Application forms may be obtained in the Office of the Associate Dean for Undergraduate Programs on the day of the test. Special note: Students must be admitted to the Teacher Education Program at least one quarter before taking 3010, 3030 and certain other courses in the College.

Students applying for admission to the Teacher Education Program are: (1) Obtain an application form in the dean's office during registration time at the beginning of the quarter. Speech and hearing tests are usually administered on registration days. (2) Proceed to the Speech and Hearing Center (at the corner of Yale and Stadium Drive) on one of the specified dates between the hours of 9 a.m. and 4 p.m. and complete the speech and hearing tests. Leave the application form (scan sheet) with the test administrator.

The College of Education will be informed of the speech and hearing test results. Those applicants having satisfactory speech and hearing test results, a grade point average of 2.20 or above at the termination of the previous quarter (if admitted to the University prior to fall 1966, a 2.00 GPA is sufficient), and their academic adviser's consent will be informed of their acceptance by a letter from the Associate Dean for Undergraduate Programs sometime during the quarter. Students not qualifying for acceptance will also be informed of their status by their academic adviser.

Admission to Student Teaching

Application for student teaching must be filed no later than January 1 of the academic year preceding the actual experience. For example, if a student plans to student teach during the 1979-80 academic year application must be made by January 1, 1978. Application forms may be obtained in the Office of the Director of Student Teaching, 212 Claxton Education Building.

Students majoring in special education—speech and hearing, and in special education—hearing impaired, are required to make application for clinical practice or student teaching in the Department of Special Education and Rehabilitation and in the Office of the Director of Student Teaching. Before admission to the student teaching quarter, the student must have fulfilled the following requirements:

1. Full admission to the Teacher Education Program no later than the quarter preceding student teaching (i.e., all conditions relative to admission satisfied).
2. Completion of the professional core courses (Education 3010, 3020, 3030 and Educational Psychology 2430 or 3810).
3. Completion of at least 90 percent of course work in the endorsement area(s).
4. Completion of the special methods courses at The University of Tennessee.
5. Completion of the Student Teaching Seminar and the September experience (non-credit).
6. Senior standing and a minimum grade point average of 2.0 on work completed at The University of Tennessee.

The fifteen-hour student teaching experience is evaluated on a satisfactory-unsatisfactory basis. The hours are included in the University policy requiring a 2.0 in the last 45 hours work.

The most important criterion in placing student teachers in the public schools is the value of the experience for preparing for teaching. The University cannot guarantee the geographic locale desired by the student though effort will be made to follow the student's wishes. The University maintains student teaching centers in East Tennessee communities so that teachers are assigned near their homes as possible in order to preserve family life.

Substitutions

It is sometimes necessary and advisable for students to substitute other courses for those required in a particular curriculum. This is particularly true of students who transfer to The University of Tennessee College of Education from another college or university. The general test of whether a substitution would be appropriate is "does the course you wish to substitute meet the spirit of the course requirement?" That is "is the content similar or perhaps more appropriate to your needs?" To initiate a substitution request the student should visit with the adviser first. If they agree that the substitution is an appropriate one, the substitution request form should be forwarded to the Office of the Associate Dean for Undergraduate Programs, Claxton Education Building 212. Approved petitions are forwarded to the Dean of Admissions for further approval, and on filing with the Undergraduate Council.

Recommendation for Certification

The application for a professional teacher's certificate should be completed early in the final quarter before graduation. Application forms may be obtained in the Registrar's Office, 215 Student Services Building and 212 Claxton Education Building.

Tennessee state regulations stipulate that the application for a professional certificate must be recommended by the teacher-training institution. The dean of the College of Education is the official designated to recommend University of Tennessee graduates for teacher certification. To receive this recommendation, the applicant must have fulfilled the following requirements:

1. A minimum cumulative grade point average of 2.0.
2. Satisfactory performance of the student teaching experience.
3. A minimum grade point average of 2.0 in the teaching field.
4. Completion of a methods course in each area of endorsement.
5. Fulfillment of all special recommendations of the Committee on Standards and Admissions.

Graduate Programs

The College of Education, through the Graduate School, offers programs leading to the Master of Science degree, the Master of Education degree, the Master of Arts in College Teaching degree, the
Students interested in this program should consult with a member of the faculty of the Graduate School of Library and Information Science.

Students should work closely with faculty advisers in planning programs of study. The chosen curriculum must be followed as outlined to assure graduation and certification, and any proposed substitution for a required course should be filed for approval before the end of the junior year.

NOTE: Students are advised to consult the University’s degree requirements as stated in the front section of this catalog as well as the requirements for the college or department.

I. Curricula for Elementary Teachers

A. Kindergarten through Grade 9

GENERAL EDUCATION .............................. 89 hours

Communications (12 hours)

English 1510-20 (4, 4); Speech 2021 (4) or 2311 (4) or any speech electives.

Health and Physical Education (18 hours)

P.E. 3450 (3), School Health 3610 (3), Psychology 2500 (4), P.E. and health electives (8 hours) must include minimum of 3 hours in each area.

Humanities (12 hours)

Literature 8 hours; the remaining hours must be chosen from foreign language (above introductory level), philosophy, religious studies, Art 1815 or 1825, or Music 1210 or 1220.

Mathematics (6 hours)

Mathematics 2110, 2120, 2130.

Natural Science (20 hours)

8 or 12 hours in biological science. Recommended series are Biology 1210, 1220 (1230 or Botany 1110, 1120). 8 or 12 hours in physical science. Recommended series are Physics 1410, 1420, 1430 or Geology 1510-20 or Astronomy 2110, 2120, 2130 or Chemistry 1110, 1120, 1130.

Social Studies (18-20 hours)

History 4 (hours) - it is recommended that the history course be taken at the sophomore level. Electives (14-16 hours) from anthropology, economics, geography, political science, and sociology. Minimum of 3 areas are required.
III. Curricula for Secondary Education (7-12)

GENERAL EDUCATION ........................................ 69 hours

Communications (12 hours)
English 1510-20 and Speech 2311.

Mathematics (12 hours)
A. English (4 hours)
B. Science (4 hours)
C. Social Studies (4 hours)
D. Health and Physical Education (4 hours)

Electives (8 hours)

TOTAL MINIMUM REQUIRED ......... 191 hours

C. Mathematics Education

1. Area Majors in Mathematics

a. Mathematics and Physical Sciences (75 hours)
   (1) Mathematics (27 quarter hours) must include at least one year's sequence in calculus or analytic geometry and calculus and at least 12 quarter hours in courses numbered 3500 or above with at least one course selected from each of the following categories:
      (a) Algebra: Mathematics 3500, 3720, 4060, 4120, 4150.
      (b) Analysis: Mathematics 3100, 3110, 4510, 4610.
      (c) Geometry: Mathematics 3310, 3320, 3330.
      (d) Probability: Mathematics 3050, 3060, 4650, 4750.
   (2) Physical Sciences—12 quarter hours in each of the following: chemistry, geology, physics.
   (3) Electives—12 additional quarter hours in physical sciences and/or mathematics.

2. A student may not receive credit for both Mathematics 1540 and 1500. A maximum of 16 quarter hours in courses numbered 3500 or above with at least one course selected from each of the following categories:
   (a) Algebra: Mathematics 3060, 3120, 3720, 4150, 4160, 4170.
   (b) Analysis: Mathematics 3100, 3110, 4510, 4520, 4530.
   (c) Geometry: Mathematics 3130, 3320, 3340, 3310.
   (d) Probability: Mathematics 3050, 3060, 4650, 4660, 4670.
   (2) Related Sciences—12 quarter hours in physics, and 12 quarter hours in each of two of the following subjects: astronomy, biology, botany, chemistry, geology, microbiology, zoology.
   (3) A student may not receive credit for both Mathematics 1540 and Mathematics 1500. A maximum of 16 quarter hours credit may be obtained in mathematics from courses numbered below 2000.

Endorsements: Mathematics and Science, General Science

2. Mathematics and Related Sciences (72 hours)

1. Mathematics (36 quarter hours)---Must include at least one year's sequence in calculus or analytic geometry and calculus, and at least 12 quarter hours in courses numbered 3050 or above with at least one course selected from each of the following categories:
   (a) Algebra: Mathematics 3060, 3120, 3720, 4150, 4160, 4170.
   (b) Analysis: Mathematics 3100, 3110, 4510, 4520, 4530.
   (c) Geometry: Mathematics 3130, 3320, 3340, 3310.
   (d) Probability: Mathematics 3050, 3060, 4650, 4660, 4670.

A student may not receive credit for both 1540 and 1500. A maximum of 16 hours credit may be obtained in mathematics from courses numbered below 2000.

(2) Computer Science and Physics—24 hours in computer science and 12 quarter hours in physics.

Endorsement: Mathematics

2. Mathematics Major with a Minor (72 hours)

1. Mathematics (45 quarter hours)---Must include at least one year's sequence in calculus or analytic geometry and calculus, and at least 12 quarter hours in courses numbered 3050 or above with at least one course selected from each of the following categories:
   (a) Algebra: Mathematics 3060, 3120, 3720, 4150, 4160, 4170.
   (b) Analysis: Mathematics 3100, 3110, 4510, 4520, 4530.
   (c) Geometry: Mathematics 3130, 3320, 3340, 3310.
   (d) Probability: Mathematics 3050, 3060, 4650, 4660, 4670.

A student may not receive credit for both 1540 and 1500. A maximum of 16 hours credit may be obtained in mathematics from courses numbered below 2000.

(2) Computer Science and Physics—24 hours in computer science and 12 quarter hours in physics.

Endorsement: Mathematics

2. Mathematics Major with a Minor (72 hours)

1. Mathematics (45 quarter hours)---Must include at least one year's sequence in calculus or analytic geometry and calculus, and at least 12 quarter hours in courses numbered 3050 or above with at least one course selected from each of the following categories:
   (a) Algebra: Mathematics 3060, 3120, 3720, 4150, 4160, 4170.
   (b) Analysis: Mathematics 3100, 3110, 4510, 4520, 4530.
   (c) Geometry: Mathematics 3130, 3320, 3340, 3310.
   (d) Probability: Mathematics 3050, 3060, 4650, 4660, 4670.

A student may not receive credit for both 1540 and 1500. A maximum of 16 hours credit may be obtained in mathematics from courses numbered below 2000.

(2) Computer Science and Physics—24 hours in computer science and 12 quarter hours in physics.

Endorsement: Mathematics

2. Mathematics Major with a Minor (72 hours)

1. Mathematics (45 quarter hours)---Must include at least one year's sequence in calculus or analytic geometry and calculus, and at least 12 quarter hours in courses numbered 3050 or above with at least one course selected from each of the following categories:
   (a) Algebra: Mathematics 3060, 3120, 3720, 4150, 4160, 4170.
   (b) Analysis: Mathematics 3100, 3110, 4510, 4520, 4530.
above with at least one course selected from the following categories:

1. Algebra: Mathematics 3090, 3120, 3270, 4150, 4160, 4170.
2. Calculus: Mathematics 3110, 3110, 4510, 4520, 4530.
5. 15 upper-division hours in another subject used as a minor.
6. A student may not receive credit for both Mathematics 1540 and Mathematics 1550. A maximum of sixteen hours credit may be obtained in mathematics from courses numbered below 2000.

Endorsements: Mathematics

*Excluding Math 2120, 2110, 2120, 2130.
*Excluding Chemistry 1500, 1520, 1530.
*Excluding Physics 1410, 1420, 1430.
*Plant and animal science courses required.

D. Psychology Education

1. A concentration and endorsement in psychology shall require a minimum of 30 upper-division hours distributed as follows:
   - Core Psychology 2900: 16 hours
   - Psychology 3120: 4
   - Psychology 3150: 4
   - Psychology 3210: 4
   - Electives: 14 hours selected from:
     Psychology 2520, 2530, 2540, 3129, 3219, 3220, 3319, 3430, 3550, 3560, 4230, 4510, 4520, 4610, 4900; Psychology or Ed. Psych. 4840, Ed. Psych. 3110, 4110, 4340, 4800, 4850.

2. Two minors (18-27 hours for a total of 45 quarter hours) each with a minimum of 6 hours per division.

At least one of the two minors area must meet Tennessee minimum endorsement requirements for the subject area.

E. Science Education

1. Area Majors in Science
   a. Biological science (72 hours minimum)
      - Biology 1210-20-30 or Botany 1110-20-40 (12 hours).
      - Biology 3110-20-30 (12 hours).
      - Microbiology 2100 (4 hours).
      - Chemistry (excluding 1410 series): 12 hours.
      - Science electives: 32 hours minimum.
   b. Environmental Sciences: 72 hours minimum
      - Includes 12 hours biological science required, and 14 hours electives selected from astronomy, chemistry (excluding 1410 series), geography, geology, and physics.
      - Geology (16 hours).
      - Chemistry (8 hours).
      - Physics (excluding 1410 series) (4 hours).
      - Geography (4 hours).
      - Geography (meteorology or climatology) (4 hours).
      - Cartography, conservation, oceanography, or soil science (6 hours).

Endorsements: Earth Science, General Science*

F. Social Science Education

Program I

- Broad fields Social Studies (Major 72 hours)

Certification includes economics, geography, history, political science and sociology.

a. 28 quarter hours in history, including 1510-20 and 2510-20, and 12 hours in world and/or American history.

b. 8 quarter hours in each of the following: geography, political science, and sociology.

c. 4 quarter hours in anthropology.

d. 9 quarter hours in economics, including 2110-20 and an approved 4-hour course.

e. 7-8 additional quarter hours in the above-listed or related fields.

Program II

Specific subject major (45 hours plus 27 hours for a minor).

Minors: A minor is defined as 27 quarter hours in a single subject area, i.e., biology, history, French, psychology, speech, etc. A minor does not meet certification requirements in all cases.

IV. Art and Music Education

A. Art Education

GENERAL EDUCATION ............................ 67-69 hours

Communications (11-12 hours)

- English 1510-20, 4 and 3 hours in speech.

Health and Physical Education (9 hours)

Activities courses in physical education plus School Health 3510.

Humanities (15-16 hours)

- Art History 1815 and 1825, one literature course, and one elective from anthropology, philosophy, foreign language above 1000 level, upper-division history, library service, religion or music.

Mathematics (4 hours)

Natural Science (any)

Any twelve hours from the biological and/or physical sciences.

Psychology (2-4 hours)

Psychology 2500.

Social Studies (12 hours)

Any twelve hours from at least two areas.

CORE PROFESSIONAL EDUCATION .................... 9 hours

Ed. C & I 3010*, 3020, 3030*

SPECIALIZED PROFESSIONAL EDUCATION ............ 21 hours

Student teaching: Ed. C & I 4710*, 4720*; Ed. Psych. 2430 or 3810; and an elective in the College of Education.

TEACHING AREAS AND ELECTIVES .............. 84 hours

A. Major (60 hours)

Art Educ. 2100, 2120, 3920, 3210, 4120, 4130, 4150, 4160.

B. Minor (24 hours)

May be taken in any area offering a minor.

TOTAL MINIMUM REQUIRED ..................... 181 hours

*Requires admission to Teacher Education Program.

B. Music Education

GENERAL EDUCATION ............................ 65-67 hours

Communications (11-12 hours)

- English 1510-20 and 3.4 hours in speech.

Health and Physical Education (9 hours)

Activities courses in physical education plus School Health 3510.

Humanities (14 hours)

Music 2230-30, literature course, and one elective from art, anthropology, literature, foreign language beyond introductory level, upper-division history, philosophy, or religious studies.

Mathematics (4 hours)

Natural Science (11 hours)

Three courses from the biological and/or physical sciences, to include Physics 1810.

Psychology (4 hours)

Psychology 2500.

Social Studies (12 hours)

Any 12 hours, to include at least two areas.

CORE PROFESSIONAL EDUCATION ............ 9 hours

Ed. C & I 3010*, 3020, 3030*

SPECIALIZED PROFESSIONAL EDUCATION ............ 21 hours

Student teaching: 4710*, 4720*; Educ. Psych. 2430 or 3810; and a senior elective in the College of Education.

TEACHING AREAS AND ELECTIVES ............ 86-108 hours

Concentration in Vocal Music (Voice Principal)

a. 45 quarter hours in Music Education: 1010-20; 2110; 2411; 2421; 2431; 3130; 3150; 4420; 4510.

b. 49 quarter hours in Music: 1111-21-31; 1123-23-33; 2111-21-31; 2113-23-33; 2430; voice 22 hours; plus piano proficiency and required ensemble participation.

Concentration in Vocal Music (Piano or Organ Principal)

a. 45 quarter hours in Music Education: 1010-20; 2110; 2411; 2421; 2431; 3130; 3150; 4420; 4510.

b. 59 quarter hours in Music: 1111-21-31; 1123-23-33; 2111-21-31; 2113-23-33; 2430; piano or organ 22 hours; voice 6 hours; plus required ensemble participation.

Concentration in Elementary Music Education

(Voice Principal)

a. 31 quarter hours in Music Education: 1010-20; 2110; 2411; 2421; 2431; 3141-42; 3150; 4420; 4441-42-43; 4450.

b. 49 quarter hours in Music: 1111-21-31; 1123-23-33; 2111-21-31; 2113-23-33; 2430; voice 22 hours; piano proficiency; required ensemble participation.

Concentration in Elementary Music Education

(Piano or Organ Principal)

a. 45 quarter hours in Music Education: 1010-20; 2110; 2411; 2421; 2431; 3141-42; 3150; 4420; 4441-42-43; 4450.

b. 59 quarter hours in Music: 1111-21-31; 1123-23-33; 2111-21-31; 2113-23-33; 2430; piano or organ 22 hours; voice 6 hours; required ensemble participation.

Concentration in Instrumental Music

a. 38 quarter hours in Music Education: 1010-20; 2411-12-13; 2421-22-23; 2431-32-33; 3130; 3150; 3410; 4420; 4430.

b. 61 quarter hours in Music: 1111-21-31; 1123-23-33; 2111-21-31; 2113-23-33; 2430; 3112; 3122 or 4124; principal instrument 22 quarter hours; secondary instrument 6 quarter hours; piano proficiency; participation in required ensemble.

- Music 4460 is required for all students whose principal instrument is wind or percussion.

TOTAL MINIMUM REQUIRED ..................... 181-208 hours

GENERAL REGULATIONS FOR ALL MUSIC EDUCATION STUDENTS

A. Required participation, with credit or as a registered audition, in a major instrumental or vocal organization each quarter in residence (on-campus) as a music education major, as approved by the student's advisor and the directors of the organizations concerned. Students preparing to be band directors are
expected to enroll in Marching Band unless officially excused.
Instrumental Major: Concert Band; University Marching Band; or University Orchestra.
Vocal Major: Concert Choir; University Glee Clubs.
Elementary Music Education Major. Same as Vocal Major.
B. Transfer students must take proficiency examinations in applied music, music theory, sight singing and dictation prior to registration in music education curricula.

*Requires admission to Teacher Education Program.

V. Health, Physical Education, Recreation, and Safety

A. Concentration in Elementary Physical Education (1-9)
GENERAL EDUCATION ................. 48 hours
Communication (12 hours) English 1510-20 and Speech 2021 or 2311.
Humanities (16 hours) English 2510 or 2520 plus 12 hours of electives.
Social Studies (16 hours) Sociology 1510 plus 12 hours of electives.
Electives ................. 27 hours Hours to be selected for minor, endorsement, or electives (None of the 27 hours may be taken in lower-division physical education.)
TOTAL MINIMUM REQUIRED ........ 196 hours

*Requires admission to Teacher Education Program.

D. Minor in Secondary Physical Education (27 hours)
(Open only to students with a concentration in elementary physical education.)
P.E. 4120; 4140; 4230; 3210; 3170 or 3230; 4110; 4120; 4230; 3220 or 3170; 4440 or 4450; 3330; 4410 or 3010; 3180; 3240; and 13 hours electives from any upper-division P.E. course.

E. Minor in Dance (27 hours)
P.E. 2040-50-60; 3010; 3030; 3033; 3050; 3060; 3070; 3090; 3151; 4010; 4060; 4330 or 4340 or 4550; 4560.

F. Minor in Coaching (28-31 hours) Zoology 2920-30 or 13080; 124200, 4940, Physical Education 3230, 3250, 3900, 4160. Two courses in the area of coaching to be chosen from the following: Physical Education 3110, 3120, 3130, 3200, 4460.

G. Concentration in Recreation
GENERAL EDUCATION ................. 97 hours
Natural Sciences (16 hours minimum) 4 hours selected from: chemistry, physics, geology, astronomy, or Geography 3530.
4 hours selected from: biology or botany, zoology, the areas of anatomy or physiology. At least 8 additional hours selected from any one of the following: Anthropology 1510 or 4530.
Social Sciences (16 hours minimum) Sociology 1510 and 4530.
At least 9 additional hours selected from Sociology 1520, 3130, 4510, 4530, or Rural Sociology 3420 or Human Services 2690, 4900, 3300 or Political Science 2530, 2020, 2510-20, 2565-66, 2710-20-30.
Behavioral Sciences (16 hours minimum) Psychology 2500.
At least 12 additional hours selected from Psychology 2520, 3120, 3550, 4560, 4550, 4610 or Educational Psychology and Guidance 2430, 2510, 2520, 4130, 4190, 4690, or Criminal Justice 2530, 4110, 3210, 3220, 4260, 4610, 4680, 4810, 4910.
Communications (15 hours minimum) English 1510-20, Speech 2311.
At least 3 additional hours selected from Speech 2351, 3021, Communications 1110; Journal- nism 2110, 3710, Educ. C & I 4750.
Health and Safety (3 hours minimum) School Health 3210 or Safety 3520.
Humanities (16 hours minimum) At least 4 hours selected from English 2000 level and above.
At least 3 hours selected from History. At least 9 additional hours selected from English 2000 level and above. History 2590-20, 2350, 2950, Anthropology 2530, Geography 3660, Classics 2810, 2820, 2910-20, 3210-20, 3310-20, 3320, 4010, Philosophy 1510-20, 2530, 3150, 3530, 3910, 2550, Religious Studies 2610, 2611, 2620.
Cultural Arts (12 hours minimum) 4 courses at least 1 from the following arts: Music 1210-20, 2421-51, 4260, 4270 Theatre 1510, 3525-53-54, 3262-63 Art 2710, 1815-25 P.E. 3900, 2070 (Dance).

H. Concentration in Public Health
GENERAL EDUCATION ................. 86 hours
Communications (12 hours) English 1510-20 and Speech 2311.
Health and Physical Education (11 hours) Physical Education electives.
Humanities (16 hours) English—any 4 hours from literature Anthropology 1510 or 4530, Philosophy or religious studies elective (4) Art or music elective (4).
Mathematics (4 hours) Natural Science (20 hours) Chemistry or physics sequence (4, 4, 4) Biology 1210-30-20, Zoology 2530-30. Psychology (4 hours) Psychology 2500.
Social Sciences (18 hours) Economics 2110 Geography 2110 or 2120 or Political Science 1530 History 2010-20 or 2510-20 Sociology 1510.
CORE PROFESSIONAL EDUCATION ........ 9 hours Ed. C & I 3101-20-30.

PROFESSIONAL RECREATION
EDUCATION ................. 22-30 hours Recreation 1100, 3140, 3100, 3200, 4130, 4200, 3880, 4500.
FIELD STUDY ................. 18-33 hours Recreation 1000, 2000, 3000, 4000.

SKILLS AREAS ......... 18-24 hours
Student selects two of the following skill areas and complete at least 3 courses (9-12 hours in each):
Art: Art 1115-25-35, 2115, 2215, 2315, 2515, 2516, Art Education 2110, 2110, 2120.
Dance: Physical Education 4310, 3100-20-30, 3040, 3100, 4320.
Sports: Physical education—2 team sports, 3 individual sports, 3 routes.
Free electives (to be added to above requirements to total minimum of 192 hours for the degree).

TOTAL MINIMUM REQUIRED ........ 192 hours
<table>
<thead>
<tr>
<th>Course Title</th>
<th>Credits</th>
<th>Notes</th>
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<tbody>
<tr>
<td><strong>Humanities (12 hours)</strong></td>
<td></td>
<td>Literature (4 hours); elective from anthropology, art, literature, library and information science, upper-division history, music, philosophy, religious studies, or foreign language above the introductory level (8 hours).</td>
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<tr>
<td><strong>Mathematics (3 hours)</strong></td>
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<td>Elective (Math 2110 recommended).</td>
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<tr>
<td><strong>Natural Sciences (16 hours)</strong></td>
<td></td>
<td>Biological science (12 hours); Physical science (4 hours).</td>
</tr>
<tr>
<td><strong>Social Studies (16 hours)</strong></td>
<td></td>
<td>History 2510, 2520 and electives from anthropology, economics, geography, political science or sociology (8 hours).</td>
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<tr>
<td><strong>CORE PROFESSIONAL EDUCATION</strong></td>
<td>8 hours</td>
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<tr>
<td>Ed. C &amp; I 3101* and 3030*.</td>
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<td><strong>SPECIALIZED PROFESSIONAL EDUCATION</strong></td>
<td>42 hours</td>
<td>42 hours</td>
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<tr>
<td>Language Arts (12 hours): Educ. C &amp; I 3290, 3290, 3280 and three elective hours.</td>
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<td><strong>Mathematics Methods (3 hours):</strong></td>
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<td>Ed. C &amp; I 3350.</td>
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<tr>
<td>Psychology or Educational Psychology (9 hours): Ed Psych 2430 or 3610 and six elective hours.</td>
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<td>Child Development (6 hours):</td>
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<tr>
<td>Nine-credits elective.</td>
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<tr>
<td><strong>Student Teaching in Elementary Schools (9 hours):</strong></td>
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<tr>
<td><strong>SPECIAL EDUCATION COURSES</strong></td>
<td>36 hours</td>
<td>36 hours</td>
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<tr>
<td>Special Education 3333, 3520, 4110, 4120, 4130, 4150, 4351, 4361, 4440, 4460, 4770, 5260, 5620.</td>
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<td><strong>SPECIAL EDUCATION STUDENT TEACHING</strong></td>
<td>15 hours</td>
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<tr>
<td>Special Education 4680, 4861, 4882.</td>
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<tr>
<td><strong>ELECTIVES</strong></td>
<td>10 hours</td>
<td>10 hours</td>
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<td><strong>TOTAL MINIMUM REQUIRED</strong></td>
<td>189 hours</td>
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*Requires admission to Teacher Education Program.

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<th>Course Title</th>
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<tr>
<td><strong>B. Concentration in Combined General Special Education and Elementary Education</strong></td>
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<td><strong>GENERAL EDUCATION</strong></td>
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<td><strong>Communications (12 hours):</strong></td>
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<td>English 1510, 1520 and Speech 1211 or 2311.</td>
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<td><strong>Health and Physical Education (15 hours):</strong></td>
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<td>P.E. 3450, School Health 3510, Psychology 2500.</td>
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<td><strong>Humanities</strong> (12 hours):</td>
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<td>Literature (8 hours); elective from foreign language above the introductory level, philosophy, religious studies, art, or music (4 hours).</td>
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<td><strong>Mathematics (9 hours)</strong></td>
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<td>Math 2110, 2120, 2130.</td>
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<tr>
<td><strong>Natural Science (20 hours)</strong></td>
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<td>Biology 1210, 1220, 1230 and Physics 1410, 1420.</td>
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<tr>
<td><strong>Social Studies (16-20 hours)</strong></td>
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<td>History 2510; electives from anthropology, economics, geography, political science and sociology. Minimum of three areas to be represented (14-16 hours).</td>
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<td><strong>CORE PROFESSIONAL COURSES</strong></td>
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<td>Educ. C &amp; I 3010* and 3030*, 3030*.</td>
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<td><strong>ELECTIVE EDUCATION COURSES</strong></td>
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<td>Special Education 3333, 3520, 4110, 4120, 4130, 4150, 4351, 4361, 4440, 4460, 4770, 5260, 5620, 5610.</td>
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<td><strong>SPECIALIZED COURSES</strong></td>
<td>18 hours</td>
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<td>Special Education 4680, 4861, 4882.</td>
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<td><strong>SPECIAL EDUCATION COURSES</strong></td>
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<td><strong>TOTAL MINIMUM REQUIRED</strong></td>
<td>187 hours</td>
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*Requires admission to Teacher Education Program.

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<th>Course Title</th>
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<tr>
<td><strong>C. Concentration in the Hearing Impaired</strong></td>
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<tr>
<td><strong>a. Specialization in Early Childhood Development</strong></td>
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<tr>
<td><strong>GENERAL EDUCATION</strong></td>
<td>81-95 hours</td>
<td>81-95 hours</td>
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<tr>
<td><strong>Communications and English</strong></td>
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<tr>
<td>English 1510, 1520; Speech 1211 or 2311 or Communications 1110.</td>
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<tr>
<td><strong>Health and Physical Education (10 hours)</strong></td>
<td></td>
<td>School Health 3510, Physical Education 3450; physical education electives.</td>
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<tr>
<td><strong>Psychology (4 hours)</strong></td>
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<td>Psychology 2500.</td>
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<tr>
<td><strong>Humanities (15-16 hours)</strong></td>
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<td>English literature.</td>
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<tr>
<td>11-12 hours electives (choose 2 areas): anthropology, art, history, philosophy, foreign language (above introductory level), religious studies, music, library and information science.</td>
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<tr>
<td><strong>Mathematics (3 hours)</strong></td>
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<td>Mathematics 2110.</td>
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<tr>
<td><strong>Natural Sciences (20 hours)</strong></td>
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<td>8-12 hours in biological science: Phys. 1110-20; Botany 1110-20.</td>
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<tr>
<td>8-12 hours in physical science: Phys. 1410-20; Geology 1510-20; Astronomy 2110-20; Chemistry 1110-20-30.</td>
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<td><strong>Social Studies (17-20 hours)</strong></td>
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<td>History 1510-20 or 2510-20.</td>
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<td><strong>TOTAL MINIMUM REQUIRED</strong></td>
<td>152 hours</td>
<td>152 hours</td>
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*Requires admission to Teacher Education Program.

SPECIALIZED COURSES ........................................ 12 hours Educational Psychology 2430, Art Education 2100, Music Education 2100, Educ. C&I 3510.

AREA OF CONCENTRATION .................................... 67 hours 30 credits in speech and logic elective (3050 recommended), Audiology and Speech Pathology 3010, 4700, 4930 (or 5960); Special Education 3333, 4110, 4200, 4210, 4250, 4290, 4351, 4361, 4371 (or Educ. C&I 3511-12-13), 4870, 4871; and Pre-Student Teaching Seminar.

TOTAL MINIMUM REQUIRED ............ 190 hours

c. Specialization in Secondary Education GENERAL EDUCATION .................. 82-83 hours Communications (12 hours) English 1510, 1520; Speech 1211 or 2311 or Communications 1110.

Health and Physical Education (9 hours) School Health 3510 and physical education electives.

Humanities (15-16 hours) English literature: 11-12 hours electives (choose from two areas: anthropology, art, history, music, philosophy, foreign language (above introductory level), religious studies, music, library and information science.

Mathematics (4 hours) Mathematics 2012.

Natural Sciences (20 hours) (If major in science education, student must take 12 hours in the biological sciences.) 8-12 hours in biological science; 8-12 hours in physics; 8-12 hours in natural science: Physics 1410-20-30, Chemistry 1110-20-30, Geology 1510-20-30.

Psychology (4 hours) Psychology 2500.

Social Studies (18 hours) History 1510-20 or 2510-20. Choose 3 areas from: anthropology, economics, geography, political science, sociology.

CORE PROFESSIONAL COURSES ............... 9 hours Educ. C&I 3010*, 3020, 3030*.

SPECIALIZED PROFESSIONAL EDUCATION ........................................ 6 hours Educational Psychology 3810 and appropriate methods course for major area.

HEARING IMPAIRED EDUCATION COURSES ............ 67 hours Audiology and speech pathology elective (3050 recommended); Audiology and Speech Pathology 3010, 4700, 4930 (or 5960); Special Education 3333, 4110, 4870, 4210, 4220, 4230, 4250, 4290, 4351, 4361, 4371 (or Educ. C&I 3512-22-23), 4870, 4871; and Pre-Student Teaching Seminar.

MAJOR AREAS ........................................... 30-45 hours NOTE: 30 quarter hours are required for graduation and Council on the Education of the Deaf Certification. For Tennessee State Certification for Teaching Non-handicapped Students, additional credit hours are required.

TOTAL MINIMUM REQUIRED for GRADUATION IMPAIRED EDUCATION CERTIFICATION .............. 194 hours

d. Specialization in Multiply Handicapped GENERAL EDUCATION .................. 82-83 hours Communications (12 hours) English 1510, 1520; Speech 1211 or 2311 or Communications 1110.

Health and Physical Education (10 hours) School Health 3510; Physical Education 3450 and physical education electives.

Psychology (4 hours) Psychology 2500.

Humanities (15 hours) English literature. 12 hours electives—choose 2 areas: anthropology, art history, philosophy, foreign language (above introductory level), religious studies, music, library and information science.

Mathematics (3 hours) Mathematics 2110.

Natural Science (20 hours) 8-12 hours in biological science: (choose one series) Biology 1210-20-30; Botany 1110-20. 8-12 hours in physical science: Physics 1410-20-30; Geology 1510-20; Astronomy 2110-20-30, Chemistry 1110-20-30.

Social Studies (19-20 hours) History 1510-20 or 2510-20. Choose 3 areas from: anthropology, economics, geography, political science, sociology.

CORE PROFESSIONAL COURSES ............... 9 hours Educ. C&I 3100*, 3020, 3030*.

SPECIALIZED PROFESSIONAL EDUCATION AND MAJOR .......................... 67 hours Audiology and speech pathology elective (3050 recommended); Audiology and Speech Pathology 3010, 4700, 4930 (or 5960); Special Education 3333, 4110, 4200, 4210, 4220, 4230, 4250, 4280, 4290, 4351, 4361, 4371, 4870, 4871; and Pre-Student Teaching Seminar.

AREA OF SPECIALIZATION .................. 30 hours Selected from the following courses: Special Education 3310, 3333, 3350, 4110, 4120, 4130, 4150, 4160, 4400, 4460, 4840, 5400, 5401, 5620, and special education electives.

TOTAL MINIMUM REQUIRED ............ 188 hours

D. Concentration in Speech and Hearing GENERAL EDUCATION .................. 84 hours Communications (12 hours) English 1510-20, Speech 2311.

Health and Physical Education (6 hours) Activities 1410-20-30 recommended plus health and physical education electives (both areas must be represented).

Humanities (11 hours) English (4 hours from 2000-level literature). Electives representing two areas from the following: anthropology, art, English (literature), foreign language (above introductory level), history (upper division), Library and Information Science 3510-20-30, music, philosophy, and religious studies.

Mathematics elective (4 hours).

Natural Sciences (16 hours) 8 hours biological science sequence; 8 hours biological science elective.

Psychology (4 hours) Psychology 2500.

Social Studies (20 hours) History 1510-20 or 2510-20; Economics 1110-20 plus 12 hours representing three areas from anthropology, economics, geography, political science, sociology.

GENERAL ELECTIVES ........................................ 19 hours

CORE PROFESSIONAL COURSES ............... 9 hours Education C&I 3100*, 3020, Special Ed. 4030.

SPECIALIZED PROFESSIONAL EDUCATION .......................... 19 hours Psychology 2520 or 2530, Psychology 3550 or 2540 or Ed. Psych. 2430 or 3810, 11-12 hours of upper division psychology or educational psychology including Psychology 3150 (Ed. Psych. 3110, 4800, 4860 recommended).

TEACHING AREAS AND ELECTIVES ............. 69 hours Special Education 3333, three-hour elective (4110 or 4140 or 4130 recommended). Audiology and Speech Pathology (or Special Education) 3310, 3710, 4040, 4310, 4400, 4720, 4930. Audiology and Speech Pathology 3010, 3060, 3065, 3020, 4610, 4650. Clinical Practicum Courses (12-15 hours): Audiology and Speech Pathology (or Special Education) 4320-30-40; Special Education 4341, 4342.

TOTAL MINIMUM REQUIRED ............ 181 hours

*Requires admission to Teacher Education Program.

The following area of endorsement requires completion of requirements of the elementary (K-9) or secondary education curriculum.

E. Concentration in Partially Seeing

a. Completion of requirements of Elementary (K-9) or Secondary Education Curriculum;

b. Special Education and Rehabilitation 3333, 4110, 4120, 4150, 4250, 4840;

c. Six quarter hours selected from the following: Special Education and Rehabilitation 3510, 4110, 4120, 4150, 4250, 4840;

d. Office Administration 2110 (for those lacking high school credits in typing).

TOTAL MINIMUM REQUIRED: Total hours required for endorsement in the above Special Education program appear on curriculum sheets available from the faculty advisors.

VI. Vocational-Technical Education

A. Business Education

See curricula for Secondary Education (7-12) p. 107 for General Education and Professional Education requirements.

B. Distributive Education

GENERAL EDUCATION .................. 85 hours Communications (12 hours) English 1510-20 and speech elective.

Health and Physical Education (9 hours) School Health 3510 and health and P.E. electives.

Mathematics (8 hours) Mathematics 1540 and 1550.

Humanities (16 hours) Literature elective (4) plus 12 hours humanities electives.

Natural Science (12 hours) Biological or physical science sequence.

Psychology (7-8 hours) Psychology, 2500; Psychology 2520 or Educ. Psych. 3110.

Social Studies (20 hours) History 1510-20 or 2510-20; Economics 2100-30-30; plus elective.


SPECIALIZED COURSES .................. 45 hours Business Adm. 1110; Office Adm. 4310 or 4320; Accounting 2110; Marketing 3110-20, 4140, 4310, 4510; Finance 3120; Industrial Management 3010; Textile elective; Business Law 4110; Distributive Educ. 4140; Advertising 3000.

TOTAL MINIMUM REQUIRED ............ 183 hours

*Requires admission to Teacher Education Program.

C. Industrial Education

Option 1. Concentration in Trades and Industries

GENERAL EDUCATION .................. 66 hours Communications (11 hours) English (8 hrs); speech elective (3 hrs). Health and Physical Education (9 hours) Health and P.E. electives. (Both areas must be represented.)

Humanities (15 hours) Literature elective (4 hrs). Two additional areas taken from the following: philosophy, anthropology, art or art education, literature, foreign language, music or religious studies.
Departments of instruction

Art and Music Education

Professors:
C.H. Ball (Head), Ph.D. Peabody;
A.W. Humphreys, Ed.D. Illinois; J.H. Jones,
Ed.D. Columbia; W.J. Julian, Ph.D.
Northwestern; J.W. Robertson, Ed. D. Columbia.

Associate Professors:
H.L. Giff, B.S. Milwaukee State Teachers;
H.N. Hull, Ed.D. George Peabody; J.C. Mintz,
Ed. D. Columbia; A.W. Tipps, Ph.D. Michigan.

Assistant Professors:
W.H. McDaniel, M.S. Tennessee; J.P. Watkins,
M.S. Tennessee.

Art Education (141)

1511 Field Experiences in Teaching Art (1) Field experiences in which students perform tasks related to teaching and to teacher roles. S./NC. May be repeated for credit.

2100 Introduction to Art Education in the Schools (3) Art grades 1 through 12; growth and development, objectives, motivation, evaluation, experiences with school media. 1 hr and 2 labs.

2110 Drawing, Painting, and Design Activities in Elementary School (3) Prereq. 2100. 1 hr and 2 labs.

2120 Drawing, Painting, and Design Activities in Junior and Senior High School (3) Prereq. 2100. 1 hr and 2 labs.

3110 Crafts in the Elementary School (3) Prereq. 2110. 1 hr and 2 labs.

3210 Art in Secondary School Program (3) Program planning, materials and equipment; relation to other school experiences. Classroom observation. Prereq. 9 hrs in art education. 1 hr and 2 labs.

3511 Field Experiences in Teaching Art (1) Field experiences in which students perform tasks related to teaching and to teacher roles. S./NC. May be repeated for credit.

3820 Clay in School Program (3) Exploring methods of hand-built forms, glazing and firing procedures. Prereq. 2100. 1 hr and 2 labs.

3930 Textiles in School Program (3) Exploration of processes of weaving, stitching, batik, and silk screen. Prereq: 2100. 1 hr and 2 labs.

4120 Designing Teaching Aids for Art in School Program (3) Design and preparation of charts, exhibits, slides, films, and other teaching aids for art grades one through twelve. Prereq: 2100 or consent of instructor. 1 hr and 2 labs.

4130 Three-Dimensional Design in School Program (3) Exploration of wood, wire, metal, plastics, and other sculptural materials. Prereq: 2100 or consent of instructor. 1 hr and 2 labs.

4150 Lettering, Posters, and Displays in the School Program (3) Design and layout; techniques and procedures. Prereq: 2100 or consent of instructor. 1 hr and 2 labs.

4160 Appreciation of the Arts in School Program (3) Prereq: 2100 or consent of instructor. 1 hr and 2 labs.

4350-50-70 Problems in Art Teaching (3, 3, 3) Prereq: Consent of Instructor.

4410 The Administration and Organization of Recreational Arts and Crafts Programs (3) Purpose of art activity in recreation; scope of activities, organizational procedures, resources, and coordination required in community arts and crafts programs.

Music Education (707)

The curricula in music education provide for five areas of concentrations: vocal music (voice principal); vocal music (piano or organ principal); elementary music education (voice principal); elementary music education (piano or organ principal); and instrumental music.

1010-20 Choral Laboratory (1, 1) Choral conducting: methods and materials, required of all music education majors. Prereq: approval of instructor.

1511 Field Experience in Teaching Music (1) Field experiences in which students perform tasks related to teaching and to teacher roles. S./NC. May be repeated for credit.

2100 Basic Experiences in Classroom Music (3) Vocal, instrumental, rhythmic, listening, music reading, and creative activities. Prereq: major in elementary or special education. Five hrs.

2110 Experiences in Classroom Music (3) Vocal, instrumental, rhythmic, listening, music reading, and creative activities. For music education majors. Prereq: Approval of instructor, one year of music theory. 2 hrs and 1 lab.

2411-12-13 Methods, Materials, and Techniques of String Class Instruction (2, 2, 2) Structure, use, techniques of playing, care, and repair of principal instruments in school instrumental organizations. Emphasis on techniques necessary for basic understanding and effective teaching of the instruments. Practical use of current instructional materials. 2hrs per week.

2421-22-23 Methods, Materials, and Techniques of Woodwind Class Instruction (2, 2, 2) Structure, use, techniques of playing care and repair of principal instruments in school instrumental organizations. Emphasis on techniques necessary for basic understanding and effective teaching of the instruments. Practical use of current instructional materials. 2hrs per week.

2431-32 Methods, Materials, and Techniques of Brass Class Instruction (2, 2) Structure, use, techniques of playing, care and repair of principal instruments in school instrumental organizations. Emphasis on techniques necessary for basic understanding and effective teaching of the instruments. Practical use of current instructional materials. 2hrs per week.

2433 Methods, Materials, and Techniques of Percussion Class Instruction (2, 2) Structure, use, techniques of playing, care and repair of principal instruments in school instrumental organizations. Emphasis on techniques necessary for basic understanding and effective teaching of the instruments. Practical use of current instructional materials. 2hrs per week.

3110 Teaching Music in the Primary Grades (3) Singing, rhythmic, instrument, listening, creative, and music reading activities; evaluation; materials appropriate for Grades K-3. For elementary education majors only. Prereq: 2100 or 2110; Educational Psychology 2430, 2430, Pre- divisive standing.

3120 Teaching Music in the Intermediate and Upper Grades (3) Singing, rhythmic, instrument, listening, creative and music reading activities; evaluation; materials appropriate for grades 4-6; Primarily for elementary education majors. Prereq: Music 2100 or 2110; Educational Psychology 2430 and upper division standing.

Music Education in the Graduate Program

5000 Thesis

5002 Non-Thesis Graduation Completion (3-15)

5210 Organization, Administration, and Supervision of Art in the School Program (3)

5310 Art of Education (3)

5320 Program Development in Art Education (3)

5850-60-70 Problems in Art Education (3, 3, 3)
3130 Teaching Music in the Elementary School (3) Singing, rhythm, instrumental, instrument borrowing, creative, and musical activities; evaluation; materials appropriate for grades K-6. For music education majors only. Prereq: 2110, Educational Psychology 2430 or 3210, and two years of music theory.

3141 Guiding Musical Learning Experience in the Primary Years (3) Course designed primarily for music education student majoring in elementary music education in which emphasis is given to musical skills and learnings appropriate for children, ages five through eight. Prereq: 2110 and Educational Psychology 2430.

3142 Guiding Musical Learning Experiences in the Intermediate Years (3) Course designed primarily for music education student majoring in elementary music education in which emphasis is given to musical skills and learnings appropriate for children, ages nine through eleven. Prereq: 3141.

3150 Teaching Music in Junior and Senior High Schools (3) Procedures, techniques, curriculum, scheduling, administration, evaluation, materials and equipment, community relations. Prereq: Two years of music theory; coreq: 3511.


3511 Field Experiences in Teaching Music (1) Field experiences in which students perform tasks related to teaching music to teacher roles. S/NC. May be repeated for credit.

4350-60-70 Problems in Music Teaching (3, 3, 3)

4410 The Administration and Organization of Recreational Music Programs (3) Purpose of music in recreation; scope of activities, organizational procedures, resources, and coordination required in community music programs.

4420-30 Choral and Instrumental Conducting (3, 3) Reading, conducting, and interpretation of vocal and instrumental scores suitable for church, and community groups. 4420 deals with vocal music; 4430 with instrumental music. Prereq: 1010-20 and three hours credit from 2411-21-31 series and two years of music theory. Must be taken in sequence. 2 hrs and 1 lab.

4441-42-43 Teaching Class Piano (1, 1, 1) For majors in music, music education, or elementary education. Prereq: Approval of instructor.


4460 Marching Band Techniques (3) Functions, organization, and direction of a school marching band. Prereq: Senior standing and approval of instructor; coreq: 3511.

4510 Choral Methods and Materials (3) Organization and administration, teaching techniques, choral literature, and interpretation. Prereq: 1010-20, 4420, one year of voice instruction, two years of music theory. 2 lecture hrs and 2 one-hr labs; labs meet with 1010-20.

GRADUATE

5000 Thesis

5002 Non-Thesis Graduation Completion (3-15)

5150 Studies in Secondary School Music (3)

5210 Psychological Foundations in Music (3)

5220 Administration and Supervision of School Music (3)

5230 Comparative Teaching Procedures in Music Education (3)

5240 Evaluation Procedures in Music Education (3)

5250 Role of Music in Education (3)

5260 Music for Early Childhood (3)

5270 Studies of Music for Children in Primary Grades (3)

5320 Advanced Choral Literature and Conducting (3)

5350-60-70 Special Problems in Music Education (3, 3, 3)

5410 Advanced Band Literature and Conducting (3)

5510-20-30 The Talent Education Program of Shinichi Suzuki (2, 2, 2)

5710 Research in Music Education (3)

5810-20-30-40 Seminar (3, 3, 3, 3)

Continuing and Higher Education (267)

Professors:
E.M. Ramer (Acting Head), Ed.D., Columbia;
W.H. Coffield, Ph.D., Iowa; J.P. Goddard, Ed.D., Tennessee;

Associate Professor:
K.O. McCullough, Ph.D., Florida State.

Assistant Professor:

GRADUATE

5000 Thesis

5002 Non-Thesis Graduation Completion (3-15)

5060 Adult Education: A General Survey (3)

5410 Seminar in College Teaching (3)

5330 Theory and Research in Human Learning (3)

5360-70 Problems in Continuing and Higher Education (3, 3, 3)

5440 American Higher Education (3)

5450 Instruction in Higher Education (3)

5460 Adult Development (3)

5510 Governance of Colleges and Universities (3)

5550 Fiscal Problems in Higher Education (3)

5660 Program Planning in Continuing and Higher Education (3)

5860 The Community-Junior College (3)

5955-65-75 Practicum in Continuing and Higher Education (3, 3, 3)

5960-70 Seminar in Continuing and Higher Education (3, 3, 3)

6450 Community Education for Adults (3)

Certiﬁcation

Curriculum and Instruction

Professor:
J.J. Bellon (Head), Ed.D., California (Berkeley);
C.B. Allison, Ph.D., Oklahoma; J.E. Alexander, Ed.D., Kentucky; P.C. Burns, Ph.D., Iowa; L.N. Chiles (Emeritus), M.A., Missouri;
E.S. Christenbury (Emeritus), Ph.D., Georgia;
M.A. Christiansen, Ph.D., Kansas; A.R. Davis, Ph.D., Ohio State; D.J. Dessart, Ph.D., Maryland; H. Fraendson, Ph.D., Illinois; R.L. French, Ph.D., Missouri; L.O. Haaby, Ed.D., Columbia;
A.M. Johnston, Ph.D., Chicago; A. Malik, Ed.D., Columbia; E.E. Mauldin, M.S.L.S., Illinois;
N. Mays, Ph.D., Southern Illinois; W.C. Murphy, Ph.D., Alabama; J.R. Ray, Ed.D., Tennessee;
P.S. Thurman, Ed.D., George Peabody;
L.A. Wantling (Emeritus), Ph.D., Ohio State;

Associate Professors:
K.J. Blank, Ph.D., Ohio State; L.G. Breen, Ed.D., Oregon;
B.L. Bromann, Ed.D., Tennessee;
W.L. Chestefish, Ed.D., Texas Tech; C.A. Chance, Ph.D., Ohio State; E.D. Doak, Ed.D., Colorado;
G.E. Estes, M.S., Kent State; A.D. Grant, Ph.D., Western Illinois; H.K. Henson, Ph.D., Indiana;
R.L. Hodges, Ph.D., Texas; R. Howard, Ph.D., Ohio State;
P.E. Huff, Ph.D., Ohio State; K.J. Jost, Ed.D., Oklahoma; L.N. Knight, Ph.D., Texas;
B.M. Kolker, Ed.D., Indiana; M.E. Myer, Ed.D., Florida;
C.E. Roeseke, Ph.D., Ohio State;

Assistants Professors:
L.C. Cagle, Ed.D., Georgia; C.L. Fairies, Ph.D., Illinois; J.R. Harker, Ed.D., Tennessee;
M.F. Kainowski, Ed.D., Massachusetts; H. Ruffin, Ed.D., Kansas; A.M. Rutherford, M.Ed., Virginia;
A.A. VanFleet, Ph.D., Florida; S.J. Wynn, M.S., Tennessee.

Instructors:

Undergraduate programs in the Department of Curriculum and Instruction provide the general professional courses for the preservice education of teachers in elementary and secondary schools.

Educational Curriculum and Instruction (301)

1410 Efficient Reading and Study Skills (1) Improvement of reading and study skills. Prereq: 1500.

1500 Introduction to Early Education (3) (Same as Child and Family Studies 1500).

2010-20-30 Field Study in Education (3, 3, 3) Problems of teachers in active service in the fields of methods of teaching, curriculum materials, school-community relationships, and school organizations.

3010 History and Philosophy of Education (3) Role of philosophy in education; realism, Neo-Thomism, pragmatism, and other contemporary movements; major ideas, historical roots, and modern applications. Prereq: Admission to Teacher Education. Undergraduate credit only.

3020 Principles and Organization of Education (3) Relations of current educational problems and practices; organizational patterns; financing of public education; professionalization of teaching. Undergraduate credit only.

3030 Social Foundations and Curriculum (3) Culture and society and their influence on curriculum; principles, problems, and procedures of subject matter selection, sequence, grade placement, and time allotment; curriculum issues; state curriculum policies and practices. Prereq: Admission to Teacher Education. Undergraduate credit only.


3110 Curriculum II (3) Prereq: Ed. Psych. 1000, Psych 2110, Ed. Psych. 2510, Ed. C&I 3100 or consent of instructor.

3150 Analysis of Teaching (3) Use of interaction analysis to determine how teachers classify verbal interactions between teacher and student; related nonverbal behavior techniques. Prereq: Consent of instructor.

3160 Microteaching (3) Emphasis upon the development of instructional skills. Students teach a series of lessons to small groups of students in elementary or secondary schools. Lessons are videotaped and the students and instructor evaluate the teaching behaviors recorded on the tape. Prereq: Consent of instructor.
3260 Teaching Language Arts in the Elementary School (3) Methods and materials in teaching writing, spelling, and language. Undergraduate credit only. May be taken prior to or concurrently with C J 3260. Prereq: Educational Psychology 2430 or equivalent, admission to Teacher Education.

3270 Teaching Social Studies in the Elementary School (3) Materials and methods. Undergraduate credit only. Prereq: Educational Psychology 2430 or equivalent, admission to Teacher Education.

3280 Teaching Developmental Reading in the Elementary School (3) Beginning course in sequence designed to teach teachers to develop skills and understandings necessary for operation of successful developmental reading program in the elementary school. Prereq: Ed. Psych. 2430 or equivalent and admission to Teacher Education.

3281 Teaching Developmental Reading in the Elementary School (3) Second course in sequence designed to teach content and skills of teaching reading in the elementary school. Prereq: 3280.

3310 History of Education (3)

3320 History of Education in the United States (3)

3350 Teaching Arithmetic in the Elementary School (3) Goals, methods, materials, and evaluation. Undergraduate credit only. Prereq: Educational Psychology 2430 or equivalent; Mathematics 2110-20-30; admission to Teacher Education.

3510 Books and Related Materials for Children (3) (Same as Library and Information Science 3510.)

3511-12-13 Field Experiences in Teaching: Elementary (1, 1, 1) Field experiences in which students perform tasks related to teaching and to teacher roles. May be taken separately or concurrently by consent of instructor. Must be taken before student teaching. Prereq: 3511—Ed. Psych. 2430 or equivalent; 3512-13—admission to Teacher Education. S/NC.

3520 Books and Related Materials for Young People (3) (Same as Library and Information Science 3520.)

3521-22-23 Field Experiences in Teaching: Secondary (1, 1, 1) Field experiences in which students perform tasks related to teaching and to teacher roles. May be taken separately or concurrently by consent of instructor. S/NC.

3531-32-33 Field Experiences in Teaching: Social Foundations (1, 1, 1) For description, see 3521-22-23. S/NC.

3561 Teaching of Speech and Drama, Grades 7-12 (3) For description, see 3565.

3562 Teaching of Modern Foreign Languages: Oral Communication Skills, Grades 7-12 (3) For description see Edu. C & I 3563. This course and Edu. C & I 3562 are required for certification in foreign languages. Must be taken concurrently with 3565.

3563 Teaching of Modern Foreign Languages: Reading, Literature, Grammar and Composition, Grades 7-12 (3) For description see Edu. C & I 3563. This course and Edu. C & I 3562 are required for certification in foreign languages. Must be taken concurrently with 3565.

3565 The Teaching of Social Studies, Grades 7-12 (3) Purposes, techniques, materials, and evaluation of directed observation in public schools; preparation of teaching plans and materials. Undergraduate credit only. Prereq: Educational Psychology 3180 or equivalent.

3564 The Teaching of Science, Grades 7-12 (3) For description, see 3565.

3565 The Teaching of Latin, Grades 7-12 (3) For description, see 3565. (Same as Classics 4210.)

3567 Teaching Language, Composition and Speaking, Grades 7-12 (3) For description, see 3565. Both this course and Ed. C & I 3566 are required for certification in English.

3568 Teaching Reading, Literature, and Listening, Grades 7-12 (3) For description, see 3565. Both this course and Ed. C & I 3567 are required for certification in English.

3720 Teaching Science in the Elementary School (3) Methods and materials, undergraduate credit only. Prereq: Ed Psych 2430 or equivalent, admission to Teacher Education.

3751 Teaching of Mathematics: Numerical and Algebraic Concepts, Grades 7-12 (3) For description, see Edu. C & I 3563. Both this course and 3752 are required for certification in mathematics.

3752 Teaching of Mathematics: Geometry and Analysis, Grades 7-12 (3) For description, see Edu. C & I 3563. Both this course and 3751 are required for certification in mathematics.

4010 International Education: Europe and the Americas (3) Historical, philosophical and sociological foundations; special reference to England, USSR, France and Germany.

4110 Philosophies of Education in Cultural Perspective (3) Education in relation to liberal, conservative, reactionary, and radical currents of thought in American culture.

4150 School Library Administration (3) (Same as Library and Information Science 4150.)

4210 Curriculum in Elementary School Social Studies (3) Survey of current curricula, approaches and trends in elementary school social studies. Prereq: Teaching experience or student teaching.

4215 Teaching Elementary School Science (3) Methods and materials used in teaching of science in elementary school. Developmental and diagnostic/corrective programs. Not open to students with recent course or background in teaching of elementary school science.

4216 Teaching Elementary School Mathematics (3) Methods and materials used in teaching of mathematics in elementary school. Developmental and diagnostic/currrentive programs. Not open to students with recent course or background in teaching of elementary school mathematics.

4217 Teaching Elementary School Language Arts (3) Methods and materials used in teaching of elementary school language arts. Development of functional relationships with other curriculum areas, diagnostic procedures, and corrective work. Not open to students with recent course or background in teaching of elementary school language arts.

4250 Initiating the Activities Program (3) Prereq: Educational Psychology 2430, six quarter hours of methods of teaching in the elementary school, and junior or senior standing.

4260 Philosophy of Education: Introductory Studies (3) Truth, knowledge, and valuation in relation to work of the schools. Prereq: 3010, Educational Psychology 2430 or 3810, or equivalents.

4261 Educational Classics (3) Discussion of selected writings on education from Plato to Dewey.

4280 Diagnosis and Correction of Classroom Reading Problems (3) Prereq: 3280 or equivalent.

4300 Developmental Reading in the Secondary School (3)

4301 Teaching Developmental Reading (3) Methods and materials used in teaching of reading in the elementary school. Course includes development of functional relationships with other curriculum areas, diagnostic procedures and remedial work. Not open to students with recent course work or background in the teaching of reading.

4303 Language Development of Children: Birth-Preadolescence (3) In-depth view of language development: birth through preadolescence; application of process of language development to instructional programs for early and middle childhood.
4750 Utilization of Instructional Media (3) introduces the basic communications process, need for instructional media, instructional development, selection and utilization of media and basic software production techniques. (Same as Library and Information Science 4750 and Vocational-Technical Education 4750.)

4810 Student Teaching in the Elementary School (9) Application for student teaching must be filed not later than final quarter of junior year. Students should hold themselves available to do this work in off-campus centers. Must be taken with 4820. Prereq: C/E 3260, 3260-70, 3350, 3720; Educational Psychology 2430; Library Service 3510; minimum grade point average of 2.0. Undergraduate credit only. S/NC.

4820 Student Teaching in the Elementary School (6) Must be taken with 4810. Undergraduate credit only. S/NC.

4840 Introduction to Data Processing in Education (3) Analysis of current activities in field of educational data processing. Emphasis on curricular, administrative, and research opportunities in education, using modern electronic data processing methods and machines.

4850 Student Teaching in Elementary School (K-3) (6) Application filed no later than second quarter of junior year with placement one quarter prior to quarter of graduation. Prereq: Educ. C A 3260, 3270 or 3720, 3280, 3350, 4450; CFS 3120, 3210. S/NC.

4851 Student Teaching in Elementary School (K-3) (9) Application filed no later than second quarter of junior year with placement at least one quarter prior to quarter of graduation. Prereq: Educ. C A 3260, 3270 or 3720, 3280, 3350, 4450; CFS 3120, 3210.

4860 Programmed Learning (3) Theories of learning as related to technology of programmed instruction; techniques and applications of programming; 2 lectures and 1 lab. Prereq: Psychology 3210, Educational Psychology 3730, or consent of instructor. (Same as Psychology 4860.)

GRADUATE

Graduate instruction in the Department of Curriculum and Instruction provides opportunities to improve the effectiveness of educational service in a number of areas.

5000 Thesis

5002 Non-Thesis Graduation Completion (3-15)

5040 Seminar in Elementary School Language Arts (3)

5100 History of European Education (3)

5110 History of Education (3)

5120 Principles of Education (3)

5140 ComparativePhilosophies of Education (3)

5141 Pragmatism in Education (3)

5142 Existentialism in Education (3)

5143 Supervised Readings in Philosophy of Education (3)

5150-40-70 Seminar (1-3, 1-3, 1-3)

5180-90-5200 Educational Specialist Research and Thesis (3, 3, 3)

5210 Seminar in International Education: Asia and Africa (3)

5211 Instructional Strategies in Elementary School Social Studies (3)

5220 Supervised Readings in International Education (3)

5230 Diagnosis and Remediation of Arithmetic Difficulties (3)

5240 Creative Thinking and Expression in Elementary School (3)

5250 Secondary School Instruction (3)

5270 The Elementary School Curriculum (3)

5280 Teaching Language Arts in the Elementary School (3)

5281 Teaching Social Studies in the Elementary School (3)

5282 Teaching Science in the Elementary School (3)

5283 Programs and Materials in Teaching Elementary Science (3)

5284 Seminar in Teaching Elementary Science (3)

5290 The Teaching of Mathematics in the Elementary School (3)

5291 Programs and Materials in Elementary School Language Arts (3)

5292 Seminar in Research and Theory in Teaching Mathematics in the Elementary School (3)

5302 Psychology of Reading (3)

5304 Programs and Materials for Reading Instruction (3)

5305 Trends and Issues in Teaching Reading (3)

5306 Teaching Reading to the Linguistically Differently Learner (3)

5350 Curriculum Development and Evaluation (3)

5360-70 Curriculum Development in the Local School (3, 3)

5385 Mathematics Laboratories in Elementary School (K-9) (3)

5380 Diagnosis of Remedial Reading Problems (3)

5381 Remediation of Remedial Reading Problems (3)

5382 Developmental Reading Practice (3)

5383 Remedial Reading Practice (3)

5390 Organization and Administration of Reading Programs (3)

5410 The High School Curriculum (3)

5530 Curriculum Laboratory for High Schools (3)

5580 Curriculum Planning and Development (3)

5610 Educational Statistics (3)

5620 Problems in Direction and Supervision of Student Teaching (3)

5630 Practicum in the Individualization of Instruction (3)

5640 Newer Trends in Elementary Education (3)

5650-60 Curriculum Laboratory for Elementary Schools (3, 3)

5670 Curriculum Laboratory for Early Childhood Education (3)

5680 Teacher-Parent-Community Relations (3)

5690 Design of Instructional Media (3)

5691 Advanced Production of Audiovisual Software (3)

5692 Evaluation of Instructional Media (3)

5693 Administering Instructional Media Programs (3)

5694 Utilization of Educational Television and Radio (3)

5695 Research in Instructional Media (3)

5696 Practicum Experience in Instructional Media (3)

5710 Techniques of Research in Education (3)

5720 Classroom Observation and Analysis (3)

5800 Seminar in Cooperative Curriculum Research (3)

5820 Seminar in the Teaching of Mathematics (3)

5825 Teaching Mathematics in the Middle and Junior High School (3)

5830 Seminar in Mathematics Education (3)

5835 Teaching Mathematics in the Senior High School and Community/Junior College (3)

5841 Trends and Issues in Early Childhood (3)

5842 Problems in Education: Early Childhood (3)

5843 Seminar in Early Childhood Education (3)

5844 Mathematics in Early Childhood Education (3)

5845 Social Studies and Science in Early Childhood Education (3)

5846 Language Arts in Early Childhood Education (3)

5850-60-70 Problems in Education: English (3, 3, 3)

5851-61-71 Problems in Education: Mathematics (3, 3, 3)

5852-62-72 Problems in Education: Social Studies (3, 3, 3)

5853-63-73 Problems in Education: Science (3, 3, 3)

5854-64-74 Problems in Education: Language Arts (3, 3, 3)

5855-65-75 Problems in Education: General Curriculum (3, 3, 3)

5856 Problems in Education: Instructional Materials (3)

5866-76 Problems in Education: Instructional Materials (3, 3)

5857-67-77 Problems in Education: Foreign Languages (3, 3, 3)

5859-69-79 Problems in Education: Conservation (3, 3, 3)

5899 Field Experience (1-6)

5900 Seminar in the Teaching of English in the Secondary School (3)

5901 Linguistics and the Teacher of English (3)

5902 Teaching Composition in the High School (3)

5903 Teaching Fiction in the Secondary School (3)

5904 Teaching the Mass Media in the English Classroom (3)

5905 Teaching English in the Community/Junior College (3)

5906 Teaching Poetry in Grades 7-12 (3)

5907 Teaching Drama in Grades 7-12 (3)

5908 Developing Speaking and Listening Skills in Grades 7-12 (3)

5909 Instructional Theory and Design (3)

5910-20-30 Problems in Lieu of Thesis (3, 3, 3)

5911 Directing the Forensic Program (4)

5912 Play Production in Secondary Schools (4)

5950 Reflective Thinking: The Method of Education (3)

5960 Teaching Natural Science (3)

5961 Seminar in Science and Environmental Education (3)

5970 Teaching the Social Studies (3)
Educational Administration and Supervision (292)

Professors:

Associate Professors:
H.F. Aldmon, Ed.D. Tennessee (Vice Chancellor for Student Affairs); G.W. Harris, Jr., Ph.D. Michigan; P.M. Husen, Ed.D. Stanford.

GRADUATE

5000 Thesis

5002 Non-Thesis Graduation Completion (3-15)

5100 Internship in Educational Administration (3)

5120 Introduction to Educational Administration (3)

5180-90-5200 Educational Specialist Research and Thesis (3, 3, 3)

5220 Philosophy and Theory in Educational Administration (3)

5230 Seminar in the Behavioral Sciences for Educational Administration (3)

5250 The Politics of Education (3)

5310 School Administration in a Multi-Ethnic Society (3)

5420 District Level Administration (3)

5430 Building Level Administration (3)

5440 Introduction to Law, Finance, and Business Management at the Building Level (3)

5450 Organization of the School Program (3)

5470 Introduction to School Facility Planning (3)

5480 Introduction to Supervision and Personnel Administration (3)

5490 Administration of Community Education (3)

5530 Introduction to Educational Planning (3)

5560 Analysis and Interpretation of Research for Educational Administrators (3)

5600 Seminar in Communication Skills for Educational Administrators (3)

5711-21-31 Problems in Educational Administration and Supervision: School Operation (3, 3, 3)

5712-22-32 Problems in Educational Administration and Supervision: Higher Education (3, 3, 3)

5713-23-33 Problems in Educational Administration and Supervision: State School Administration (3, 3, 3)

5714-24-34 Problems in Educational Administration and Supervision: Preparation Programs (3, 3, 3)

5715-25-35 Problems in Educational Administration and Supervision: Community Education (3, 3, 3)

5720 Seminar in Urban School Administration (3)

5730 School Business Management (3)

5740 School Law (3)

5751-61-71 Problems in Educational Administration and Supervision: Theory (3, 3, 3)

5752-62-72 Problems in Educational Administration and Supervision: Finance (3, 3, 3)

5753-63-73 Problems in Educational Administration and Supervision: Transportation (3, 3, 3)

5754-64-74 Problems in Educational Administration and Supervision: Business Management (3, 3, 3)

5755-65-75 Problems in Educational Administration and Supervision: Personnel (3, 3, 3)

5756-66-76 Problems in Educational Administration and Supervision: School Plant (3, 3, 3)

5757-67-77 Problems in Educational Administration and Supervision: Organization and Structure (3, 3, 3)

5758-68-78 Problems in Educational Administration and Supervision: School Law (3, 3, 3)

5759-69-79 Problems in Educational Administration and Supervision: Supervision (3, 3, 3)

5770 Maintenance of School Plants (3)

5780 Supervision (3)

5790 School Board-Superintendent Relationships (3)

5810 Survey Research Methods (3)

5830 Contemporary Economics and Educational Finance (3)

5890 Decision Making and Decision Theory in Educational Organizations (3)

5910-20-30 Problems in Lieu of Thesis (3, 3, 3)

5980 Administration in Higher Education (3)

5981 Specialized Seminar in Education Administration and Supervision: School Operation (3)

5982 Specialized Seminar in Education Administration and Supervision: Higher Education (3)

5983 Specialized Seminar in Education Administration and Supervision: State School Administration (3)

5984 Specialized Seminar in Education Administration and Supervision: Preparation Programs (3)

5991 Specialized Seminar in Education Administration and Supervision: Theory (3)

5992 Specialized Seminar in Education Administration and Supervision: Finance (3)

5994 Specialized Seminar in Education Administration and Supervision: Business Management (3)

5995 Specialized Seminar in Education Administration and Supervision: Personnel (3)

5998 Specialized Seminar in Education Administration and Supervision: School Law (3)

6000 Doctoral Research and Dissertation

6040 Seminar in Educational Administration and Supervision (1, 1, 1)

6100 Internship in Educational Administration (3)

6210 Modern Trends in the Theory and Practice of Educational Administrators and Supervisors (3)

6220 Programs for the Professional Preparation of Educational Administration and Supervision (3)

6480 School Personnel Administration (3)

6480 Special Topics in School Personnel Administration (3)

6530 Futuristic Educational Planning Methods (3)

6550 State-Federal Relations in Education (3)
Educational Psychology and Guidance (311)

Professors:

Associate Professors:

Assistant Professors:

1000 Career Development: Exploration and Experience (3) Exploration of occupations based upon analysis of self and occupational requirements; development of commitment to teaching and understanding of teaching-learning problems in the classroom. Prereq: Consent of instructor. 5/NC.

2000 Field Experience (1) Field experiences in working with children and youth and their teachers. Students will perform various teaching tasks and be given opportunity to act in teaching roles. May be repeated a total of six credit hrs.

2430 Child Study (3) Child learning and development: study of individual children, ages 5-12. Prereq: Psychology 2500 or equivalent; coreq: either Educational Psychology and Guidance 2000 or 2 hr/week field experience.

2510 Child and Adolescent Study (4) Encompasses study of principles of behavior, intervention techniques, principles of child and adolescent development, special categories of children, child in relation to family and community, and methods of studying children. Prereq: Educational Psychology 1000 and Psychology 2110 or consent of instructor.

2520 Study of Self and Self-Concept (4) Study of (1) student understanding of how the self develops so that prospective teacher can better understand pupils and (2) student's increased understanding of himself. Prereq: Educational Psychology 1000, Psychology 2110, and Educational Psychology 2510 or consent of instructor.

3000 Field Experience (1) Field experiences in working with children and youth and their teachers. Students will perform various teaching tasks and be given opportunity to act in teaching roles. May be repeated a total of six credit hrs.

3110 Classroom Behavior Management (4) Student will develop understanding of behavior management procedures and skill in utilizing behavior management procedures in shaping pupil classroom behaviors. Prereq: Psychology 2110.
School of Health, Physical Education, and Recreation
Madge M. Phillips, Director

At the undergraduate level professional preparation programs are offered for teachers of health, physical education, dance, and/or recreation and for administrators of public health or recreation programs. For information on graduate programs leading to the Master of Science, the Master of Public Health, Educational Specialist, the Doctor of Education, or the Doctor of Philosophy degrees, see the Graduate Catalog.

The School of Health, Physical Education, and Recreation also provides activities programs for all students in physical education and service courses in health and safety.

Health and Safety Education


Associate Professors: I.A. Ahmed, Ph.D. Oregon, M.D. Punjab (India); A.J. Browne, Ed.D. Tennessee; J.D. Gorski, Dr. P.H. UCLA; C.B. Hamilton, Dr. P.H. Oklahoma.

Assistant Professors: A.I. Pickett, M.S. Columbia; A.F. Thompson, Ph.D. Michigan.


Public Health (839)

1110 Principles in Personal Health (3) To develop ability to approach health scientifically and to develop justifiable confidence in judgments affecting personal health.

2040 Seminar in Human Sexuality (2) Problems and responsibilities of being male and female. S/N/C.

2050 Seminar in Drug Use and Abuse (2) Intensive look at problems related to use and abuse of drugs. S/N/C.

3000 Foundations of Health Science (3) In-depth study of content areas relating to personal health and contemporary health problems, i.e., mood modifying products, consumer health, international health, personal health practices, reciprocal relationships involving man, disease and environment. (Same as School Health 3000.)

3210 First Aid and Emergency Care (4) Theory and practice of first aid and emergency care. Instruction in medical self-help. Course leads to Red Cross Certification in Advanced First Aid and Emergency Care. (Applicant must be at least 18 years of age for certification.) (Same as School Health 3210.)

3310 Communicable and Noncommunicable Diseases (3) Modern concepts of disease; etiology of common communicable and chronic disease problems including prevention and control. Prereq: One year of biological science and one course in bacteriology.

3320 Sanitation (3) History of sanitary awakening; disease-producing relationships and controls of water, sewage, refuse, milk, meat and other foods, air, insects, and soil; sanitation of homes, swimming pools, industrial plants, markets, restaurants, camps, and public bathing places. Health habit-building by educating of the student groups, grounds, lighting, acoustics, thermal control, and safety provisions. Prereq: One year biological science, one course in microbiology. 2 hrs and 1 lab.

3330 Introduction to Public Health (3) Philosophy, organization, and functions of federal, state, and local official and voluntary public health agencies. Includes periodic field trips.

4120 Community Health Problems—Alcoholism (3) Explores problems of alcoholism regarding overall health of community. Emphasis placed on factors making alcoholism a serious public health problem. Various types of educational programs to control the disease covered.

4130 Community Health Problems—Suicide (3) Explores problems of suicide regarding overall health of community.

4140 Community Health Problems—Death Education (3) Exploration of ramifications of death and dying as related to personal and community health.

4210 Urban and Industrial Health (3) Health problems created by a burgeoning population and the megalopolis; industrial health problems of concern to management, supervisor, and industrial worker, control of occupational diseases, poisons, toxic incidents, and other conditions incidental to industry.

4220 Communications for Better Health (3) Selective study of communications in health enterprise. Consideration in logical progression the problems of transmitting current and new information to practitioners; communications among members of modern health teams, among health agencies, and use of mass media for transmitting health information.

4410 Consumer Health and Safety Education (3) Survey of major consumer health and safety problems; selecting, purchasing, and financing of safety and medical services.

4411 Instructor's Advanced First Aid and Emergency Care (3) Designed to teach First Aid. Satisfactory completion qualifies one for American National Red Cross Certification as an Advanced First Aid and Emergency Care Instructor. (A requirement for this certification is that an applicant must be at least 21 years of age.) Prereq: 3210 or valid Advanced First Aid and Emergency Care Certificate.

4420 Drug Abuse Education (3) Drug abuse problem and suspected causes; pharmacy care of drugs and effects on society and methods of drug abuse education.

4700-19-20 Field Practice in Public Health (3, 3, 3) Field practice in public health under supervision of public health profession. S/N/C.

4730 Workshop in Public Health Education (3-4) For teachers, nurses, case workers, sanitarians, and other voluntary and public health agency persons; emphasizes the problem-solving approach through small group interaction, case method, and critical incident technique. May be repeated for credit.

4840-50-60 Problems in Public Health Education (1, 1, 1) Individual identification and study of current problems in public health education. Extensive reading of literature required.

GRADUATE

5002 Non-Thesis Graduation Completion (3-15)

5010-20-30 Workshop in Public Health (3-4, 3-4, 3-4)

5070-80-90 Field Practice and Seminar in Public Health (3-5, 3-5, 3-5)

5110 Environmental Health (3-5)

5120-30 Occupational Health and Safety (5, 5)

5150 Industrial Toxicology (3)

5220 Health and Sickness in the Focus of Public Health Education (2)

5410 Epidemiology (3)

5420 Administration of Public Health (3)

5430 Vital and Medical Statistics (4)

5440 Methods and Materials in Public Health Education (4)

5540 Factors in Problem Solving for Community Health (5)

5550 The Public Health Educator in Community Organization and Development (4)

5560 Functions and Roles of the Public Health Educator (5)

5580 Physical Activity and Health (5)

5705 Advanced Professional Health Education: Health Planning (3-5)

5710 Advanced Professional Health Education: Health Planning II (3-5)

5715 Advanced Professional Health Education: Health Planning III (3-5)

5730 Dental Health Education (3-5)

5735 Emergency Medical Services (3-5)

5745 Family Health Unit (3-5)

5750 Health and Medical Care Legislation and Law (3-5)

5755 Health Facilities Administration (3-5)

5760 Health Services Administration (3-5)

5785 Occupational Health Unit (3-5)

5790 Self-Care Unit (3-5)

5795 The Training of Paramedical Personnel (3-5)

5840-50-60 Problems in Public Health Education (1-3, 1-3, 1-3)

6000 Doctoral Research and Dissertation

6020 Critical Analysis of Writing and Research in Health Education (3)

6050-60 Seminar in Health Education (3, 3)

6210 Health Aspects of Gerontology (3)

6220 Seminar on the Nation's Health (3)

6230 International Health (3)

Safety (890)

3520 Principles of General Safety (3) Deals with principles, practices and procedures in general safety. Covers safety problems in school traffic, recreation, industry, home, and other public areas.

4410 Driver and Traffic Safety Education (5) Preparation of teachers of driver education in schools and colleges. Students are required to teach at least one one-week course. Valid driver's license required 3 hrs and 2 labs.

4420 Advanced Driver and Traffic Safety Education (5) Development of competency in teaching of driver education through use of simulation, multimedia and multiple-car driving range. Emphasis placed on teaching skills and supervision. Prereq: 4410.

4430 Sports Safety (5) Accident prevention and injury control in sports activities; philosophy of sports safety; human environmental factors and their interactions in sports injury and their control; risk-taking and decision solution strategies; and contributions of sports medicine to safety. 3 hrs lecture and 2 hrs lab.

4720 Workshop in Safety (3-6) Deals with special safety education problems. For advanced undergraduate students, graduate students, teachers, supervisors, and administrators. May be repeated for credit.

GRADUATE

6000 Thesis

5002 Non-Thesis Graduation Completion (3-15)

5320 Behavioral Problems in Safety Education and Accident Prevention (3)

5330 Problems and Research in Accident Prevention (3)

5340 Organization, Administration and Supervision of Safety Programs (3)

5350 Civil and Defense Education (3)

5720-30-40 Graduate Workshop in Safety (3-6, 3-6)

5810-20-30 Problems in Safety (1-3, 1-3, 1-3)

5870-40-90 Current Issues in Safety Education (1, 1)

6101-20-30 Internship and Research in Safety Education (3, 3)

School Health (898)

3000 Foundations of Health Science (3) (Same as Public Health 3000.)

3210 First Aid and Emergency Care (4) (Same as Public Health 3210.)

3410 School Health Instruction (3) Selection of health content in school curriculum.

3420 School Health Services (3) Development, maintenance, and protection of health of students including examination, screening, special services, communicable disease control, emergency care, and school health records.

3510 The School in Community Health (3) Role of teacher in community health education; school's responsibility in promoting healthful living and the place of existing media and agencies in program. Not open to health and physical education majors.

3610 Methods in Elementary Health Instruction (3) Preparation and presentation of health topics. Teaching method is emphasized and student participation stressed. Required for elementary teachers. Prereq: 3510 or Public Health 1110 or Nutrition 1230.

3620 The Teaching of Sex Education (3) Trends, content, methods, and materials.

3650 Methods in Secondary Health Instruction (3) Preparation and presentation of health topics. Teaching method is emphasized and student participation is stressed. Prereq: 3140.

4710 Workshop in School Health Education (3-6) For advanced students, teachers, school administrators, nurses and other paramedical school personnel. Lectures, demonstrations, films, field trips, and supervised research in special health problems. May be repeated for credit.

4810-20-30 Problems in School Health Education (1, 1, 1) Individual identification and study of current problems in school health education. Extensive reading of literature required.

GRADUATE

5000 Thesis

5002 Non-Thesis Graduation Completion (3-15)

5100 Problems and Practices in School Health (3)

5200 Teaching of Sex Education and Human Sexuality (3)

5510 Curriculum Construction in School Health Instruction (3)

5520 Evaluation in School Health Instruction (3)

5530 School Health Program Surveys (3)

5620 School Health Administration and Supervision (3)

5630-40 Workshop in School Health Education (3, 3)

5720-30-40 Graduate Workshop in Health Education (3-6, 3-6, 3-6)

5810-20-30 Problems in School Health Education (1-3, 1-3, 1-3)

6000 Doctoral Research and Dissertation

6030 Critical Analysis of Writing and Research in Health Education (3)

6050-60 Seminar in Health Education (3, 3)

Physical Education (764)

Professors: G. F. Brady (Emeritus), Ph.D. Iowa; E. K. Capen (Emeritus), Ph.D. Iowa; B. O. Franks (Chairperson), Ph.D. Illinois; A. J. Koza, Ph.D. Michigan; M. M. Phillips (Director), Ph.D. Iowa; B. A. Piotnicki (Emeritus), Ed.D. Boston; H. B. Watson, Ph.D. Michigan; H. G. Welch, Ph.D. Florida.

Associate Professors: E. H. Howley, Ph.D. Wisconsin; N. E. Lay, Ph.D. Florida; B. J. Mead, Ph.D. Purdue.


1000 Career Orientation and Performance Pre-requisites in Physical Education (2) Introduction to physical education with special emphasis on analyzing motor skills of each student. S/NC. No substitution.

1020 Physical Education: Swimming (1)

1021 Physical Education:Bowling (1)

1022 Physical Education:Basketball (1)

1032 Physical Education: Tennis (1)

2012 Physical Education: Soccer-Speedball (1)

2022 Physical Education: Volleyball (1)

2032 Physical Education: Golf (1)

2040-50-60 Dance Production (2, 2, 2) Preparation and presentation of public dance performances. Prereq: Approval of instructor.

2070 Orientation in Dance—Appreciation (3) History, aesthetic principles, and current trends in dance.

3000 Administration of Athletics (2) Conduct of program of athletic sports in high schools and colleges.

3010 Beginning Dance Techniques (2) Analytical and practical study of modern dance movements.


3040 Beginning Jazz Techniques (2) Instruction and practice in styles and techniques of jazz dance.

3050 Rhythmic Analysis (2) Emphasis on analysis of organic movement. Prereq: Junior standing, consent of instructor.

3060 Beginning Dance Composition (2) Experience in creative forms of dance. Prereq: 3010.

3070 Beginning Ballet Techniques (2) Introductory course designed to acquaint students with discipline of classical ballet, cultural, and educational values, and relationship to other dance forms.

3080 Officializing Women's Volleyball (3) Officiating based on rules of National Association for Girls and Women in Sport. National tests and ratings will be given. Both men and women are encouraged to take the course.

3090 History of Dance and the Related Arts I (2) Dance history and the arts related to it from beginning in primitive societies through the nineteenth century.

3100 Social Dance (2) Instruction, practice, and teaching in basic social dance steps.

3110 Athletic Coaching of Football (2) Fundamentals and coaching techniques. Prereq: approval of instructor.

3120 Coaching of Basketball (2) Individual and team fundamentals for the high school coach; attention given to conditioning, schedule making, and other business arrangements. Prereq: Approval of instructor.

3130 Athletic Coaching of Track and Field Events (2) Techniques and training procedures. Prereq: Approval of instructor.

3151 History of Dance and the Related Arts II (2) Survey of dance and the arts related to it tracing their development in the twentieth century.

3160 Officializing Women's Basketball (3) Officializing based on rules of National Association for Girls and Women in Sport. National tests and ratings will be given. Both men and women are encouraged to take the course.

3170 Weight Control and Physical Activity (3) Theoretic and practical experience in principles and methods of weight control and related physical activity.

3180 Track and Field (2) Methods and practical experience in various events of track and field. Special emphasis on teaching techniques, demonstration, progression, and analysis.

3200 Athletic Coaching of Baseball (2) Individual and team fundamentals for high school and college coach. Prereq: Consent of instructor.

3210 History and Principles of Physical Education (3) Principles from basic sciences of anatomy, bacteriology, biology, chemistry, physiology, psychology, and sociology applied to health, physical education and athletic coaching.

3220 Physical Fitness Activities (3) Teaching of calisthenics, conditioning activities, and weight training with emphasis on physical fitness concepts including muscular development of the body.

3240 Team Sports (2) Instruction, practice, and student teaching in selected team sports.

3250 Athletic Training Techniques (3) Theory and practice in the prevention and care of basic athletic injuries.
3260 Practicum for Physical Education Majors (1-3) Observation and limited teaching, coaching, and leadership experiences in physical education programs. Experiences intended to cover the last three years of professional preparation. May be repeated. Maximum of 10 hrs credit. S/JNC.

3320 Applied Anatomy and Kinesiology (3) Bones, joints, ligaments, and muscles involved in movements, reaction of joints and muscular mechanism to stresses and development and efficiency.

3330 Stunts and Tumbling (2) Instruction and practice; student teaching and lesson planning stressed with focus upon safety techniques.

3430 Adapted Physical Education Laboratory (1) Practical work, including student teaching, supplementing 4110.

3450 Physical Education in the Elementary School (3) Movement experiences appropriate for elementary school children: planning and teaching a developmental program.

3510 Conceptual Bases for Study of Human Movement Behavior (3) Biophysical, percepto-cognitive, and psycho-social forces causing humans to move as they do. Prereq: 1011 or 1012.

3530 The Teaching of Swimming and Lifesaving (2) Certification in ARC Water Safety Instructor Training or Senior Lifesaving with additional practice in teaching of swimming.


3560 Human Growth and Motor Development (3) Structure and functional changes in man from birth to old age, and relationship of changes to physical performance and skill development.

3570 Developmental Trends in Movement Performance of Children (2) Motion characteristics of basic movement patterns evolving in children with an emphasis upon understanding movement performance as a product of biophysical, percepto-cognitive and psycho-social variables. Prereq: 3540-50.60.

3610-20 Individual and Dual Sports (1, 1) Instruction, student teaching, and practice in organizing adult sport and recreational activities suitable for schools, churches, or community recreation centers.

3650 Teaching Strategies and Program Implementation in Elementary Physical Education (3) Understanding and employing teaching strategies appropriate to elementary physical education, and study of program content and implementation. Prereq: 3570.

3860 Basic Movement Sequences for Children (3) Movement patterns and skills which are fundamental to movement activity, with emphasis upon designing and presenting sequential learning tasks and creative activity experiences. Prereq or coreq: 3850.

3870 Practicum in Developmental Movement for Early Childhood (3) Experiences in designing and presenting developmental movement tasks to preschool children. Prereq or coreq: 3660.

3880 Structured Movement Activities in Elementary Physical Education (4) Self-testing, games and sports and dance activities included in elementary school physical education program, with emphasis upon designing and presenting sequential learning experiences. Prereq: 3870.

3890 Social Recreation (3) Theory and practice in leadership with practical experience in camp craft skills.

3980 Recreational Activities (3) Theory and practice in social recreation for camps, community centers, clubs, and schools. Course includes folk and square dance, quiet and active games, skills, stunts, other recreational activities, and program planning. (Same as Recreation 3880.)

3910 Principles and Problems of Coaching (3) Examination of practical problems and situations which prepare students to make judgments and decisions in a coaching environment. Prereq: At least sophomore standing.

4010 Advanced Dance Technique (2) Development, integration, and synthesis of previous dance vocabulary; emphasis on analysis and practice of dance principles; solo and group work. Prereq: 3520.

4020 Practicum in Dance Production (2) Prereq: Consent of instructor.

4060 Advanced Dance Composition (2) Creation and development of ideas, themes, and dance forms; solo and group work. Prereq: 3660.

4070 Stagecraft for Dance Production (2) Equipment, light design, properties, sets, and stage management.

4110 Adapted Physical Education (3) Classification of atypical students who require modified programs in physical education; activities and class organization suitable for required or special physical education classes.

4120 Administration of Physical Education (3) Selected topics in organization and administration problems related to physical education programs in schools. Emphasis placed on human relations approach to solving problems in administration.

4140 Tests and Measurements in Physical Education (3) Study of elementary statistics related to measurement. Critical examination of tests used to evaluate strength, sports skills, and physical fitness. Prereq or coreq: 3320 and Zoology 4940.

4150 Creative Rhythms for Children (3) Methods and materials for grades 1-6. 3 hrs and 1 lab.

4160 Athletic Coaching Field Experience (2) Practical experience in coaching and related responsibilities. Must be repeated. Maximum credit 4 hrs. Prereq: Approval of instructor.

4230 Program Planning in Physical Education (3) Curriculum building, course construction, and lesson planning for public schools and colleges.

4310 Folk and Square Dance (2) Materials and methods for public schools, colleges, and recreation centers.

4320 Tap Dance (2) Instruction, practice, and student teaching.

4330-40-50 (1, 1, 1) Specialization study in selected area of physical education.

4410 Wrestling (2) Theoretical and practical work for prospective teacher; emphasis on safety procedures.

4430 Women's Gymnastics (2) Development of skills on balance beam, uneven parallel bars, and side horse vaulting; special emphasis on progression, safety, and teaching techniques. Open to men and women. Prereq: 3330.

4440 Men's Gymnastics (2) Development of skills on pommel horse, parallel bars, and long horse vaulting. Special emphasis placed on safety, progression, and teaching techniques. Open to men and women.

4450 Men's Gymnastics II (2) Development of skills on still rings, horizontal bar, trampoline, and exhibition gymnastics; special emphasis placed on safety, progression and teaching techniques. Open to men and women. Prereq: 4440.

4460 The Coaching and Judging of Women's Gymnastics (2) Appreciation of techniques used in the coaching and judging of women's gymnastics according to the rules of the United States Gymnastics Federation. National tests and ratings will be given. Both men and women are encouraged to take this course. Prereq: 2734 or 4440.

4550 Methods of Teaching Dance (2) Individual work with analysis and criticism. Prereq: senior standing and approval of instructor.

GRADUATE

5000 Thesis

5002 Non-Thesis Graduation Completion (3-15)

5110 Administrative Problems in Physical Education (3)

5120 Problems of the Curriculum in Physical Education (3)

5130 Methods in Physical Education (3)

5210 Principles and Philosophy of Physical Education (3)

5220 Readings in Physical Education (3)

5230 Supervisory Problems in Physical Education (3)

5310 Analysis of Basic Motor Skills (3)

5320 Seminar in Research Techniques in Physical Education (3)

5410-20-30 Specialization Study in a Selected Physical Education Area (1-3, 1-3, 1-3)

5500 Advanced Kinesiology (3)

5510 Selected Topics in Anatomy (3)

5550 Physical Rehabilitation (3)

5580 Physical Activity and Health (5)

5600 Applied Physiology (6)

5610 Advanced Exercise Physiology (4)

5820 Experimental Techniques in Applied Physiology (3)

5850 Scientific Bases for Physical Education (3)

5810-20-30 Seminar in Physical Education (1, 1, 1)

5910-20-30 Problems and Projects in Physical Education (1-3, 1-3, 1-3)

6000 Doctoral Research and Dissertation

6010 Seminar in Physical Education (1)

6220 Independent Research (3)

6410 Practicum in Kinesiology (3)

6510-20 Issues and Problems in Physical Education (3, 3)

6610 Seminar in Exercise Physiology (2)

6640 Research Participation in Applied Physiology (1-6)

6810-20 Practicum (2, 2)

Service Program in Physical Education

The service program in physical education provides all students a program of physical education planned in accordance with their present and future needs and interests. 2701 ARC Advanced Life Saving (2)

2702 ARC Water Safety Instructor Training (2)

2703 ARC Water Safety Instructor for Handicapped (2)

2705 Archery (2)

2707 Badminton Elementary (2)

2708 Badminton Intermediate (2)

2711 Ballet Elementary (2)

2712 Ballet Intermediate (2)

2713 Ballet Advanced (2)
2714 Basketball (2)
2715 Bowling Elementary (2)
2716 Bowling Intermediate (2)
2717 Bowling Advanced (2)
2719 Equitation Elementary (2)
2725 Field Hockey (2)
2727 Flag Football (2)
2728 Folk and Square Dance (2)
2730 Foundations of Physical Fitness (Lecture, Lab, Activity) (2)
2731 Golf Elementary (2)
2732 Golf Intermediate (2)
2734 Women's Elementary Gymnastics (Coed) (2)
2735 Women's Intermediate Gymnastics (Coed) (2)
2736 Women's Advanced Gymnastics (Coed) (2)
2737 Handball Elementary (2)
2738 Handball Intermediate (2)
2739 Handball Advanced (2)
2741 Ice Skating Elementary (2)
2742 Ice Skating Intermediate (2)
2743 Ice Skating Advanced (2)
2745 Lacrosse Elementary (2)
2747 Modern Dance Elementary (2)
2748 Modern Dance Intermediate (2)
2749 Modern Dance Advanced (2)
2750 Modern Jazz (2)
2752 Paddlesball Elementary (2)
2753 Paddlesball Intermediate (2)
2755 Racquetball Elementary (2)
2756 Physical Fitness (Conditioning Program) (2)
2757 Men's Elementary Gymnastics (Coed) (2)
2758 Personal Safety and Defense for Women (2)
2759 Men's Intermediate Gymnastics (Coed) (2)
2760 Soccer (2)
2761 Men's Advanced Gymnastics (Coed) (2)
2762 Social Dance (2)
2764 Softball (2)
2765 Sport in Society (2)
2766 Racquetball Intermediate (2)
2767 Squash Elementary (2)
2770 Racquetball Advanced (2)
2771 Swimming Elementary (2)
2772 Swimming Elementary II (2)
2773 Swimming Intermediate (2)
2774 Swimming Advanced (2)
2775 Synchronized Swimming Elementary (2)
2776 Synchronized Swimming Intermediate (2)
2778 Tap Dance Elementary (2)
2779 Tap Dance Intermediate (2)
2781 Tennis Elementary (2)
2782 Tennis Intermediate (2)
2783 Tennis Advanced (2)
2784 Track and Field (2)
2785 Tumbling Elementary (2)
2786 Tumbling Intermediate (2)
2787 Tumbling Advanced (2)
2788 Volleyball Elementary (2)
2790 Volleyball Intermediate (2)
2791 Volleyball Advanced (2)
2792 Weight Control and Figure Improvement (2)
2794 Weight Training Elementary (2)
2795 Weight Training Intermediate (2)
2797 Wrestling Elementary (2)
2798 Wrestling Intermediate (2)

Recreation (853)

Associate Professor: M.L. Peters (Chairman), Ph.D. Illinois.
Assistant Professors: P. Borovik, M.S. Tennessee; C.J. Johnson, M.S. Tennessee; K.L. Krick, Dr. Rec. Indiana.
Instructor: P. Margolis, California State.

1000 Field Practice (1-6) Supervised practice in an approved agency offering leisure services. May be taken for variable credit up to 6 hrs. Each one-credit requires 25 contact hrs in the field agency. For recreation students only.

1100 Orientation to the Recreation Profession (3) Overview of types, functions, and interrelationships of delivery systems for recreation and park services.

2000 Field Practice (1-6) Supervised practice in an approved agency offering leisure services. May be taken for variable credit up to 6 hrs. Each one-credit requires 25 contact hrs in the field agency. For recreation students only. Prereq: Recreation 1000.

3000 Field Practice (1-6) Supervised practice in an approved agency offering leisure services. May be taken for variable credit up to 6 hrs. Each one-credit requires 25 contact hrs in the field agency. For recreation students only. Prereq: Recreation 1000 & 2000.

3100 Recreation Leadership Procedures (3) Principles and practice of recreation leadership: techniques and methods of working with individuals and groups in leisure activity.

3140 Philosophical Foundations of Recreation (3) Examination of recreation as personal experience; theories of play; philosophies of leisure and relationship to economy, ecology, health, government, culture, and self-realization; history of recreation movement.

3200 Planning Leisure Programs (3) Principles and methods employed in planning effective and well-balanced leisure time programs for varied groups in various settings.

3301 Outdoor Recreation Skills and Techniques I (3) Fundamentals necessary for safe participation in outdoor recreation activities such as water shooting, hunting, casting and angling, power boating, rappelling and backpacking. Emphasis on enjoyment of natural environment without disturbance or destruction of plant and animal habitats. Prereq: Consent of instructor.

3302 Outdoor Recreation Skills and Techniques II (3) Instruction in safe conduct of outdoor recreational activities such as sailing, skin diving, caving, orienteering, and nature interpretation without disturbance of environment. Provision of outdoor recreation experiences for the handicapped. Prereq: Consent of instructor.

3880 Social Recreation (3) (Same as Physical Education 3880.)


4130 Recreation Administration (3) Introduction to recreation administration, including planning, personnel, areas and facilities, program services, finances, and public relations. Prereq: 1100, 3100, 3140.

4200 Survey of Recreation for Special Populations (3) Responsibility of recreation profession to minority groups whose leisure opportunities and needs may require special services.

4500 Specialized Study in a Selected Area of Recreation (1-9) Comprehensive study in a selected specialized area within the broad field of recreation. For recreation students only. May be taken for variable credit up to 9 hrs. May be repeated for a maximum of 9 hrs credit with consent of the division. Prereq: Consent of instructor.

GRADUATE

5000 Thesis (9)
5002 Non-Thesis Graduation Completion (3-15)
5130 Interpretation of Leisure (3)
5140 Leisure Service Delivery Systems (3)
5150 Current Issues in Recreation (3)
5240 Therapeutic Recreation (3)
5250 Implementations of Recreation Services for the Ill or Disabled (3)
5260 Leisure and Mental Health (3)
5300 Seminar in Recreation (1)
5340 Administration of Recreation Funds (3)
5350 Organizational Policies for Recreation (3)
5360 Management and Operation of Recreation Facilities (3)
5440 Problems and Projects in Recreation (1-9)
5450 Specialized Study in Recreation (1-9)

Special Education and Rehabilitation (933)

Instructor: R.F. Bynum, M.S. Florida State.

The undergraduate programs in the Department of Special Education and Rehabilitation provide the general professional courses for the preservice education of candidates for certification in meeting the needs of exceptional children. Facilities are available for continuous observation and participation in direct relationships with exceptional children who are hospitalized, homebound, in residential schools, special classes, or regular classes.
Course sequences may be planned in the areas of (1) General Special Education; (2) the Hearing Impaired; (3) Speech and Hearing; (4) Rehabilitation Counselor Education.

It is possible to plan a program which will lead to certification in more than one area. For planning a program, the student must consult with an advisor in the chosen area.

General Special Education:
3333, 3520, 4110, 4120, 4130, 4150, 4351, 4361, 4410, 4420, 4461, 4861, 4862, 5260, 5620.

The Hearing Impaired:
2110, 2120, 2130, 3210, 3220, 3333, 4190, 4200, 4210, 4220, 4230, 4250, 4280, 4290, 4351, 4361, 4371, 4710, 4740, 4870, 4871, 4930, 5220, 5240, 5280, 5310, 5320, 5330, 5620.

Speech and Hearing:
3310, 3333, 3710, 4030, 4040, 4310, 4320, 4330, 4340, 4341, 4342, 4420, 4720, 4930. Other courses from Audiology and Speech Pathology: 3010, 3050, 3065, 3200, 4610, 4650.

Rehabilitation Counselor Education:
5100, 5110, 5115, 5120, 5130, 5140, 5145, 5146, 5147, 5150, 5160, 5700, 5710, 5720, 5730, 5740, 5750, 5760, 5770, 5771.

2110-23 Field Experience (1, 1, 1) Students observe, tutor, and perform teacher related tasks in special education programs. S/N.

3210-23 Field Experience II (1, 1, 1) Students observe, tutor, and perform teacher related tasks in special education programs. S/N.

3310 Articulation Disorders (4) (Same as Audiology and Speech Pathology 3310.)

3333 Education of the Exceptional Child (3) Principles, characteristics, and special needs; local and state programs for diagnosis and care; educational provisions in regular or special classes; home teaching; social and vocational guidance.

3520 Language-Speech Handicapped Child in the Classroom (3) Recognizing and understanding speech problems; observing normal and defective speech development in children; incorporating speech improvement activities into the curriculum. For students not majoring in speech and hearing.

3710 Audiology I (4) (Same as Audiology and Speech Pathology 3710.)

4000 Rehabilitation Pracitcum (3) Evaluation of client data in predicting rehabilitation prognosis. Prereq: 4230.

4030 The Public School Speech and Hearing Program (3) Organization, administration, and procedures.

4040 Appraisal of Speech and Language Disorders (4) (Same as Audiology and Speech Pathology 4040.)

4110 The Nature and Concept of Mental Retardation (3) Identification, description, and study.

4120 Education of the Mentally Retarded Child (3) Philosophy and rationale underlying the teaching and guidance of mentally retarded; methods and materials in special and regular classes. Prereq or parallel: 4110.

4130 Education of the Brain-Injured Child (3) Nature of brain-injured child; skills for identifying educational, physical, and emotional characteristics; special educational techniques.

4160 Education of Hospitalized and Homewardbound Children (3) School and home responsibility for physical care and social relationships, educational adjustment, vocational needs, and cooperation with related service resources.

4160 Education of Partially Sighted Children (3) Curricular adjustments and materials; home visits for parents' cooperation in medical care and special needs.

4190 Speech Development of the Hearing Impaired (3) Anatomy and physiology of speech system. Relationship of hearing to speech development. Theories and techniques of speech development and improvement; for hearing impaired children. Prereq: Speech 3050. (Same as Audiology and Speech Pathology 4190.)

4200 Practicum in Speech Development of Hearing Impaired (3) Application of theories and techniques of speech development and improvement with hearing impaired children. Prereq: 4190 and consent of instructor. (Same as Audiology and Speech Pathology 4200.)

4210 Language Development of Hearing Impaired (3) Systems by which formal language is presented. (Same as Audiology and Speech Pathology 4210.)

4220 Language Development for the Hearing Impaired (3) Techniques; various systems by which formal language is presented. Prereq: 4210 or consent of instructor. (Same as Audiology and Speech Pathology 4220.)

4230 Communication Processes for the Hearing Impaired (3) Various communicative skills required by hearing impaired child in language development; auditory training, speech reading, manual language and its relation to other forms of communication. Prereq: Observation practicum. (Student must acquire a degree of proficiency in use of manual language.) Prereq: Consent of instructor.

4240 Nature of Hearing Impairments (3) Basic principles of anatomy and physiology of hearing; nature and causes of hearing loss; methods and instrumentation for assessment of hearing level; interpretation of audiograms; selection and use of hearing aids; rotation of audiological services to medical and other rehabilitative disciplines. Observations and practicum.

4250 Introduction to the Psychology and Education of the Hearing Impaired (3) Offered for those planning to enter field of teaching the deaf and hard-of-hearing. Review of history of education of the deaf. Research studies relating to psychology, social adjustment, and learning of the deaf. Survey of professional literature in area of deaf and adult. (Same as Audiology and Speech Pathology 4250.)

4280 Curriculum Development in Elementary and Secondary Schools for the Hearing Impaired (3) Adaptation of curriculum development and methods in public school education to meet needs of deaf and hard-of-hearing students in residential and integrated settings.

4290 The Teaching of Reading to Hearing Impaired Children (3) Readiness activities, developmental approaches, theories, and specialized materials for curricula in teaching reading.

4310 Stuttering (4) (Same as Audiology and Speech Pathology 4310.)

4320 Clinical Practice in Speech Pathology (1-6) (Same as Audiology and Speech Pathology 4320.)

4330 Clinical Practice in Speech Pathology (1-6) (Same as Audiology and Speech Pathology 4330.)

4340 Clinical Practice in Speech Pathology (1-6) (Same as Audiology and Speech Pathology 4340.)

4341 Clinical Practice in Speech Correction in the Public Schools (3) Prereq: Audiology and Speech Pathology 4320-30-40, Special Ed. 4030 and consent of instructor. S/N.

4342 Seminar in Speech Correction in Public Schools (3) Prereq: Audiology and Speech Pathology 4320-30-40, Special Ed. 4030 and consent of instructor.

4350-60-70 Problems in the Education of Exceptional Children (3, 3, 3) Prereq: Consent of instructor.

4361-61-71 Practicum in Special Education (3, 3, 3) Students prepare and deliver units of instruction in special education programs. S/N.

4400 Voice Disorders (4) (Same as Audiology and Speech Pathology 4400.)

4410 High School Program for the Mentally Retarded (3) Trends, issues and research relating to educational and work study programs.

4450 Clinical Practice in Audiology I (1-6) (Same as Audiology and Speech Pathology 4450.)

4460 Clinical Practice in Audiology I (1-6) (Same as Audiology and Speech Pathology 4460.)

4470 Clinical Practice in Audiology I (1-6) (Same as Audiology and Speech Pathology 4470.)

4610 Nature and Characteristics of Learning and Behavior Disorders (3) Forms of academic and socially disturbing behavior, degrees of severity, possible causes, and relationships to each other. Relationships with respect to personality characteristics and developmental factors interpreted through behavioral and psychodynamic theory as well as practical situations in which learning and behavior disorders may occur.

4620 Education of the Emotionally Disturbed Child (3) Managing behaviors, models for instruction, teaching techniques and materials, and teacher-pupil family interpersonal relationships as basic to academic achievement of the pupil. Prereq: 4610.

4630 Practicum in Residential Settings Serving Children with Disturbing Behavior (3) Practice in scientifically identifying, observing, and recording disturbing behavioral patterns. Initiation of behavior changes regarding academic and social behaviors. To perform in a tutorial capacity within a residential classroom; and to take part in discussion and evaluation of relevant academic curriculum and reinforcement schedules. Prereq: 4610 and 4620 or consent of instructor.

4640 Practicum in Public School Systems Serving Children with Learning and Behavior Problems (6) Academic tutoring in a teacher/aide capacity within regular classrooms. Particular emphasis and practice in individualizing instruction for learning and behavior problem children within the regular classroom setting. Discussion and evaluation of relevant methods and mental uniques to each teaching situation. Prereq: 4610 and 4620 or consent of instructor.

4700 Audiology for Educators of the Deaf (4) (Same as Audiology and Speech Pathology 4700.)

4719 Audiometry Laboratory (1) (Same as Audiology and Speech Pathology 4719.)

4720 Audiology II (4) (Same as Audiology and Speech Pathology 4720.)

4740 Diagnostic and Remedial Approaches in Special Education and Rehabilitation (3) Critical examination of specialized tests and methods employed in the measurement of different levels of children and adults who are mentally retarded, learning disabled, multiply handicapped or physically handicapped.

4810 Student Teaching Mental Retardation (3) Prereq: Major in education of mental retardation. S/N.

4811 Student Teaching Mental Retardation (9) Prereq: Major in education of mental retardation. S/N.

4840 Educational Problems of the Cerebral Palsied Child (3) Prereq: Introduction to physical, social, and educational needs of cerebral palsied; evaluative techniques; related services.

4850 Eye Problems Encountered by the Teacher (3) Eye anatomy and hygiene; common diseases and defects; techniques of vision screening; educational adjustments for specific eye conditions; related service resources.

4870 Student Teaching with Hearing Impaired Children (8) Supervised practice with preschool, day school, and residential pupils. S/N.

4871 Practicum with Hearing Impaired Children (6) S/N.
5401 Prescriptive Teaching for Children with Learning Disabilities (3)
5402 The Exceptional Child in the Regular Classroom (3)
5403 Resource Teachers for the Handicapped (3)
5410 Instrumental Media for the Handicapped: Design, Production, and Evaluation of Prosthetic Curriculum Materials for the Deaf (3)
5450-60-70 Experience in Teaching and Supervision of Exceptional Children (1-8, 1-6, 1-6)
5490 Educational and Vocational Guidance of the Deaf and the Hard-of-Hearing (3)
5510-20-30 Administrative Practicum or Problems in Institutional Care of Children (3, 3, 3)
5540 Seminar in Language Pathology (3)
5550-60-70 Problems in the Education of Exceptional Children (3, 3, 3)
5620 Counseling Parents of Exceptional Children (3)
5630 Psychology of the Exceptional Child (3)
5700 Evaluation and Mobilization of Community Resources (3)
5710 Medical Aspects of Disability I (3)
5720 Medical Aspects of Disability II (3)
5730 Vocational Assessment in Disability Evaluation (3)
5740 Disability and Work in Society (3)
5750 Principles and Problems of Disability Evaluation (3)
5760 Seminar: Functional Capability Assessment (3)
5770-71 Current Problems in Disability Claims Evaluation (1-3, 1-3)
5820 Curriculum Development Applied to Programs for the Hearing Impaired (3)
5830 Seminar: Issues and Theories in the Education of the Exceptional Child (3)
5910-20-30 Problems in Lieu of Thesis (3, 3, 3)
5970 Juvenile Delinquency and the School (3)

Vocational-Technical Education (988)

Professor: R.J. Woodin (Emeritus), Ph.D. Ohio State.

Associate Professors: W.A. Cameron (Acting Head), Ph.D. Ohio State; M.D. Miller, Ed.D. Oregon State; E.R. Smith, Ph.D. Ohio.

3000 Introduction to Vocational Education (1) Introductory and exploratory experiences concerned with teaching careers in all areas of vocational education. Includes visitation within a vocational setting.

4750 Utilization of Instructional Media (3) (Same as Curriculum and Instruction 4750 and Library and Information Science 4750.)

GRADUATE

5002 Non-Thesis Graduation Completion (3-15)
5011-21-31 Problems in Lieu of Thesis (3, 3, 3)
5110-20-30 Current Literature (1, 1, 1)
5320-30 Agricultural Education in Off-Farm Agricultural Occupation (3, 3, 3)
5340 Agricultural Education for First-Year Teachers (3)
5470 Adult Education in Agriculture (3)
5480 Supervision of Student Teaching in Agricultural Education (3)
5490 Supervised Occupational Experience in Agriculture (3)
5620 Teaching Agricultural Mechanization in Vocational Agriculture (3)
5750-60-70 Special Problems in Agricultural Education (3, 3, 3)
Business Education (207)

Professors: G.A. Wagner (Chairman), M.S. Indiana; E.W. Davis (Emeritus), M.A. New York.

Associate Professors: A. Porreca, Ed.D. Boston; B.J. Radcliff, M.A. West Virginia; E.B. Smith, Ph.D. Ohio State; J.J. Stallard, Ph.D. Ohio State.


4010 Principles of Business Education (3) Historical background and present status; principles of vocational education applied to business education; guidance activities of business teachers.

4120 Teaching General Business Subjects (2) Materials, evaluation procedures and recent research in subject fields.

4130 Teaching Typewriting (2) Materials, methods, evaluation procedures and recent research in subject fields.

4140 Teaching Shorthand (2) Materials, methods, evaluation procedures and recent research in subject fields.

4150 Teaching Bookkeeping (2) Materials, methods, evaluation procedures and recent research in subject fields.

4230 Curriculum Construction in Business Education (3)

4610-20-30 Problems in Business Education (3, 3, 3)

4611 Problems in Business Education (115)

GRADUATE

5000 Thesis

5002 Non-Thesis Graduation Completion (3-15)

5011 Problems in Lieu of Thesis (3)

5110 Graduate Seminar: Current Problems (3)

5111-12-13 Graduate Seminar: Current Problems in Business Education (1, 1, 1)

5120 Graduate Seminar: Tests and Measurements (3)

5130 Graduate Seminar: Guidance (3)

5140 Organization and Operation of Area Vocational-Technical Schools (3)

5410-20-30 Practicum in Business Education (2, 2, 2)

5510 Evaluation of Research in Business Education (3)

5611-21-31 Problems in Business Education: Typing (3, 3, 3)

5612-22-32 Problems in Business Education: Shorthand (3, 3, 3)

5613-23-33 Problems in Business Education: Bookkeeping and Accounting (3, 3, 3)

5614-24 Problems in Business Education: Clerical Practice (3, 3, 3)

5615-25-35 Problems in Business Education: General Business (3, 3, 3)

5617 Problems in Business Education: Business Law (3)

5618-28-38 Problems in Business Education: Administration (3, 3, 3)

5619 Problems in Business Education: Psychology of Skill-Building (3)

6110-20-30 Current Issues in Business Education (3, 3, 3)

6210-20-30 Advanced Studies in Business Education (3, 3, 3)

6410 Higher Education for Business (3)

Distributive Education (273)

Professor: C.B. Coakley (Chairman), Ph.D. Wisconsin.

Assistant Professor: D.E. McNelly, Ed.D Missouri.

4110 Student Teaching in Distributive Education (9) Full-time, supervised experience in classroom teaching, coordination, club work, and adult education. Prereq.: 4310, 4320, Education 3030; Educational Psychology 3610: 4140 or equivalent. Undergraduate credit only. S/NC.

4120 School and Community Relationships for the Teacher Coordinator (6) Content dependent upon teaching assignment; human relations evolving from school, parent, business, and other community contacts. Must be taken with 4110. Undergraduate credit only. S/NC.

4130 Areas of Distribution (3) Marketing, product or service technology, social skills, basis skills, and distribution as these areas affect the distributive education curriculum in secondary and post-secondary programs.

4140 Supervised Distributive Experience (3) Minimum 200 hours experience in approved distributive business; concurrent analytic project.

4310 Organization and Operation of Distributive Education Programs (3) Background and development needs, federal and state legislation, curriculum implications; establishing, evaluating, reporting, and improving the programs.

4320 Methods and Materials in Distributive Education (3) Prereq.: 4310 or consent of instructor.

4330 Coordination Techniques in Distributive Education (3) Selecting training agencies; job analysis; selecting and briefing the training supervisors; advisory committees; adult education and other community services. Prereq.: 4310 and 4320.

4510-20-30 Problems in Distributive Education (3, 3, 3) Selected research problems in teaching and coordinating distributive education programs.

GRADUATE

5000 Thesis

5002 Non-Thesis Graduation Completion (3-15)

5110 Administration and Supervision of Distributive Education (3)

5120 Organizing and Teaching Adult Distributive Education (3)

5210-20-30 Special Problems in Distributive Education (3, 3, 3)

5616-26-36 Problems in Distributive Education: Retailing (3, 3, 3)

Home Economics Education (490)

Professors: N.P. Logan (Chairman), Ed. D. Tennessee; I. Brown (Emeritus), Ph.D. Ohio State.

Associate Professors: J.H. McElhinny, Ph.D. Florida State; S.W. Miller, Ph.D. Ohio State.

2240 Introduction to Teaching Vocational Home Economics (3) Introductory and exploratory experiences concerned with a teaching career in vocational home economics. Includes observation and participation in various educational and vocational settings.

3240 Strategies of Teaching Home Economics (4) Teaching strategies, methods, techniques and use of media. Field experience included. Prereq.: 2240.

4240 Curriculum Development in Vocational Home Economics (4) Planning of curriculum and design of instruction for the classroom. Prereq.: 2240, 2340. To be scheduled one of the two quarters immediately preceding student teaching.

4310 Student Teaching (6) Underlying philosophy, techniques, and materials: relation to school program and community. S/NC.

4509 Field Experience in Home Economics Related Occupations (4) Supervised field experience and seminar in teaching of occupations which utilize home economics skills and knowledge. Prereq.: Consent of instructor. S/NC. May be repeated.

4610 Student Teaching (9) Open to seniors or graduate students who have successfully completed one year's study at The University of Tennessee. Off-campus teaching centers (minimum of eight weeks). Prereq.: 2240, 3240, 4240, coreq.: 4310, S/NC.

4718-28-38 Honors: Home Economics Education (3, 3, 3) For juniors and seniors showing special ability and interest in home economics education. Prereq.: Consent of department head.

GRADUATE

5000 Thesis

5002 Non-Thesis Graduation Completion (3-15)

5130 Furthering Good Human Relationships in the Classroom (3)

5220 Evaluation in Home Economics (3)

5310 The Problem Method of Teaching (3)

5440 Curriculum Development and Implementation in Family Relationships Instruction (3)

5520 The Teaching of Home Economics in College (3)

5530 Organization of the Homemaking Curriculum in Secondary Schools (3)

5610 Supervision of Home Economics in the Public Schools (3)

5620 Wage Earning Programs in Home Economics (3)

5710-20-30 Special Problems for Non-Thesis Students (3, 3, 3)

5810-20-30 Problems in Home Economics Education (1-3, 1-3, 1-3)

5910-20 Seminar in Home Economics Education (3, 3)

Industrial Education (547)

Professors: J.L. Reed (Chairman), M.S. Oklahoma; R.W. Haskell, Ph.D. Purdue.

Associate Professors: J.D. Bies, Ph.D. Missouri; G.D. Cheek, Ph.D. Kansas; D.V. Brown, P.E., Ed.D. Utah State; R.R. Hanson, Ph.D. Purdue.


1240 Welding and Cutting Practices (3) Prereq.: 1642.

1610 Engine Analysis (3) Designed to give experimental laboratory experience in automotive technology. Engine tune-up and engine overhaul techniques and procedures are studied and practiced.

1620 Graphic Communications (3) Drafting as a means of communication in technology. Orthographic and multi-view drawing, conventional practices, pictorial techniques and applications of photography.

1630 Basic and Applied Electricity (3) Operation and characteristics of electrical systems and devices. Construction of demonstration apparatus and various electrical projects involving function of different types of circuits.
3210-20-30 Part-Time Programs in Cooperative Industrial Training (3, 3, 3) Principles of organization, methods, and materials.
3310 Shop Organization and Management (3)
3320-30 Materials and Methods for Teachers of Shop and Related Subjects (3, 3)
3340 School Shop Safety (3)
3610 Development and Utilization of Advisory Committees (3) Philosophy and rationale for use of craft advisory committees. Their selection, organization, implementation and utilization.
3612 Automotive Mechanics (3) Advanced laboratory experience in tune-up, overhaul, transmission, and the suspension system. Prereq: 1610.
3621 Industrial Graphics (3) Auxiliary views, sections, conventional practices, fasteners, dimensioning, working drawings and machine drafting. Prereq: 1620.
3632 Industrial Electricity and Equipment Control (3) Involves construction and application of industrial electric equipment both single and polyphase: power, control, and electric current. Emphasis placed on circuit tracing, installation, maintenance, and trouble controlling industrial equipment. Prereq: 1630.
3640 Advanced General Metals (3) Provides experience in areas of hot and cold forming of metals, molding and metal finishing, tool grinding, heat treatment, fabrication and precision measurement. Prereq: 2641.
3651 Plastic Processing (3) Plastics production equipment and related product design and processing of plastics. Prereq: 2652 and 1661.
3662 Construction Methods and Materials (3) Materials, methods, and equipment used in residential construction, including location and excavation, founda- tion, framing, roofs, interior and exterior finishes, installation and acceptable practices in assembly. Prereq: 1661.
3672 Graphic Arts Reproduction Processes (3) Graphic arts skills in printing and duplicating techniques and other modes of graphic communication.
4073-74-75 Tool and Machine Design (3, 3, 3) Tool and machine design, calculations, design systems, and designing procedures. Undergraduate credit only.
4090-91 Numerical Control (3, 3, 3) Tooling, manual programming, automatic programming, automatic programming apparatus and use of automatic programmer as a computer. Undergraduate credit only.
4110 Foremanship Training by the Conference Method (3)
4210 Methods of Teaching Shop and Related Subjects (3) Undergraduate credit only.
4220 Vocational Technical Laboratory Equipment Maintenance (3) Understanding of preventive maintenance, maintenance and calibration of instruments and power equipment used in industrial education shops.
4310-20 Curriculum Building in Trade and Industrial Subjects (3, 3) Arranging course material in trade subjects, following up results of job analyses, preparing checking sheets and individual job sheets in both trade and related subjects. Prereq or coreq: 4120.
4350-60-70 Problems in Industrial Education (3, 3, 3)
4410 Directed Teaching (6) Observation of all types of trade and industrial classes; preparation of lesson plans and supervised teaching in at least two types. Prereq: Senior standing in industrial education. Prereq or parallel: 4210. 1 hr and 5 periods. Undergraduate credit only. S/NC.
4420 Directed Teaching (9) Guided observation and teaching in trade, industrial, and/or technical programs in secondary, area, adult, part-time, and junior college industrial vocational and technical curricula. Undergraduate credit only. S/NC.
4510-11-12 Seminar in Industrial Education (3, 3, 3) Educational innovations, current events, problems, and other topics associated with the field of industrial education.
4520-21-22 New Developments in Industrial Education (3, 3, 3) Developments, pressing problems, and recent trends in field of industrial education as presented by a coordinating instructor in conjunction with knowledgeable resource personnel.
4621 Special Topics in Drafting (3) Industrial practices in specialized areas of drafting selected for the individual student. Prereq: 6 hrs drafting.
4670 Manufacturing Processes (3) The manufacturing processes of industry and their relationship to careers. Prereq: 2621, 2641, 2660, 3651, or consent of instructor.
4671 Materials and Processes (3) Organic and inorganic materials and processes used to produce finished products. Content, curriculum and techniques of laboratory operation. Prereq: Consent of instructor.
4682 Power and Energy (3) Development, control, transmission, conversion, interrelationship of power sources; content, curriculum, and techniques of laboratory operation. Prereq: Consent of instructor.
4690 Visual Communications in Industrial Arts (3) Methods of developing and transmitting ideas and information as related to industry and society. Content, curriculum and techniques of laboratory operation. Prereq: Consent of instructor.
4691 Course Construction in Industrial Arts (3) Advanced work in the selection and arrangement of course content. Emphasis upon instructional objectives, project selection and informational assignments and evaluation. Prereq: Consent of instructor.
GRADUATE
5000 Thesis
5002 Non-Thesis Graduation Completion (3-15)
5110-20-30 Administration and Supervision of Industrial Education (3, 3, 3)
5140 Organization and Operation of Area Vocational-Technical Schools (3)
5210-20-30 Special Problems in Industrial Education (3, 3, 3)
5310 Method of Research in Industrial Education (3)
5410 Improving Teachers in Service (3)
5420 Advisory Committees and Apprentice Training (3)
5430 Vocational School Administration and Management (3)
5440 Advanced Methods of Teaching Skills and Technical Information (3)
5510-20-30 Seminar in Industrial Technical Education (3, 3, 3)
5540 New Developments in Industrial Technical Education (3)
The engineer applies mathematical and scientific knowledge in planning economical ways of providing materials and energy in forms that are useful to humankind. In today's technology-based society, everyone feels the effects of the engineer's plans and decisions. Hence, there is a continuing and urgent need for engineering graduates who possess a thorough understanding of mathematical and scientific principles, who can apply these principles to the solution of practical problems, and who can view the solutions in their overall social perspective so that the actions that they recommend will be truly beneficial. It is the purpose of the College of Engineering to educate men and women to the high levels of technical competence and social understanding that will enable them to fulfill their responsibilities as professional engineers.

Graduates of the B.S. curricula offered by the College may enter directly a position in industry, government, or private practice or may pursue advanced study in graduate school. Their professional activities include research, development, design, operations analysis, construction, production supervision, and technical sales. Many practice their profession in Tennessee; but engineering knows no geographical bounds, and graduates of the College serve throughout the nation and in other countries as well.

The College of Engineering has its beginnings early in the history of the University when surveying was introduced into the curriculum in 1838. In 1877 civil engineering was first recognized as a curriculum. The first mechanical course appeared in about 1847; other mechanical courses followed, and in 1877 this body of studies was designated as mechanical engineering. By 1877 mining had found a place in the University, but it was later dropped. Electrical engineering appeared in about 1896, when a Professor of Physics and Electrical Engineering was appointed. Although metallurgy was announced in the catalog as early as 1888, it was dormant until it was revived in the Department of Chemical Engineering shortly after 1940. A separate degree in metallurgical engineering was authorized in 1957. Although the rudiments of chemical engineering appeared in the form of industrial chemistry shortly after 1900, a full chemical engineering program and a department were not established until 1938. Industrial engineering was introduced in 1940, was dropped for a time during the war years, and was reinstated in 1947. Nuclear engineering was established as a separate curriculum in 1957 in response to the rapidly increasing demand for engineers with a knowledge of nuclear phenomena. Engineering physics, a program operated jointly with the physics department, first appeared as an engineering curriculum in about 1942. Curricula in aerospace engineering and engineering mechanics were added in 1965, and a curriculum in engineering science was added in 1967.

The first dean of the College of Engineering, Professor Charles E. Ferris, was appointed in 1912. Prior to that time the engineering programs were organized as a school, with a chairman of the faculty. Other former deans are Nathan W. Dougherty, who served from 1940 to 1956, Armour T. Granger, who served from 1956 to 1965, and Charles H. Weaver, who served from 1965 to 1968.

The Cooperative Engineering Program was established at The University of Tennessee in 1926. This institution was one of the early pioneers in this valuable type of education, which originated at the University of Cincinnati in 1905. A Cooperative Engineering Scholarship Program was formally established in 1957, with emphasis on participation by students of superior ability. A conventional cooperative program, open essentially to all students in good standing in the College of Engineering, was re-established in 1967.

The Engineering Experiment Station was established in 1922. The College of Engineering has ten major undergraduate curricula in which a student may specialize: aerospace, chemical, civil, electrical, industrial, mechanical, metallurgical, nuclear engineering, engineering physics and engineering science.

Agricultural engineering is taught in the College of Agriculture with facilities located on the Agricultural Campus. The agricultural engineering curriculum is offered cooperatively by the College of Agriculture and the College of Engineering. Details of the curriculum may be found in the College of Agriculture section of this catalog.

Facilities

The College of Engineering is housed in Ferris, Estabrook, Perkins, Dougherty and Barry Halls, and the Nuclear Engineering Building, located on the southeastern end of the campus.

Ferris Hall. This building houses the offices, laboratories, and shops of the electrical engineering department and the Water Resources Laboratory. There is also an auditorium with a seating capacity of about 300 persons, and a remote input/output terminal connecting with The University of Tennessee Computing Center.

Estabrook Hall. Some operations of the Departments of Civil Engineering and Engineering Science and Mechanics, and of the Engineering Experiment Station are carried on in Estabrook Hall.

Perkins Hall. This building houses the Departments of Civil Engineering, Engineering Science and Mechanics, Industrial Engineering, and the Office of the Dean of the College of Engineering. The building contains laboratories, drafting rooms, and a small auditorium with a capacity of about 80 persons.

Nuclear Engineering Building. This building houses operations of the nuclear engineering department and it contains laboratories and equipment for monitoring, counting, and investigating various nuclear
phenomena; it also houses subcritical reactors. 

Nathan W. Dougherty Engineering Building. This building, the most recent and largest of the engineering buildings, houses the Departments of Chemical, Metallurgical and Polymer Engineering, Mechanical and Aerospace Engineering. In addition to classrooms and instructional laboratories, it provides modern facilities for various types of research.

Berry Hall. This building is used by the Department of Civil Engineering and the Engineering Experiment Station.

Tau Beta Pi National Headquarters 
The College of Engineering of The University of Tennessee is honored to have the National Headquarters of Tau Beta Pi, the National Engineering Honor Society, housed on its campus. This honor was conferred to the College by the efforts of R.C. "Red" Matthews, who served as secretary-treasurer for the organization from 1905 to 1947. The suite of offices, located in Dougherty Hall, is occupied by Mr. R.H. Nagel, secretary-treasurer, and his staff.

Chi Epsilon National Headquarters 
The College of Engineering of The University of Tennessee is also honored to have the National Headquarters of Chi Epsilon, the National Civil Engineering Honor Society, located in Perkins Hall. Chi Epsilon was founded in 1922. Dexter C. Jameson, Jr., associate professor of civil engineering, was elected to serve as the first executive secretary of Chi Epsilon in 1972.

Cooperative Engineering Program 
The five-year Cooperative Engineering Program is offered to students in the College of Engineering in order to provide a superior engineering education that includes the opportunity to combine significant experience in industry with academic preparation.

Cooperative work assignments differ from part-time or summer employment in that they involve regularly scheduled cycles of full-time academic quarters alternated with full-time work quarters—usually seven, a minimum of five—in career-related, planned assignments of progressive complexity and responsibility. In exposing the student in this manner to the world of work, the College of Engineering and the facilities of industry join together to offer a broader and richer preparation for postgraduate employment and for life in general than can be provided by a conventional academic program alone. This experience in an industrial and professional environment contributes to the student's maturity, increases the scope of acquaintances and concepts, and enables the student to define more clearly educational and career interests and objectives. Some of the experience received is at a subprofessional level not available to an engineer after graduation.

yet is of great significance in total education and effectiveness. 

Admission to the Cooperative Engineering Program is open to any student in the College of Engineering (or majoring in agricultural engineering in the College of Agriculture) who is in good standing, whose record at the University indicates capability and dependability, and who is acceptable to a co-op employer. In general work periods begin at the end of the second or third quarter of the freshman year and continue for seven alternating work and school cycles. Applicants must be able to schedule a minimum of five such cycles before the beginning of their senior work in order to qualify for co-op placement.

Academic schedules for co-op students are set apart elsewhere in this section. A brochure with further details may be obtained from the Office of the Coordinator, Cooperative Engineering Program, College of Engineering.

Binary Program 
A binary program in engineering education is available at The University of Tennessee. The College of Engineering has agreements with a number of liberal arts colleges to conduct a five-year program, three years of which will be given at the liberal arts college and the last two years at The University of Tennessee in engineering. At the end of the fifth year, the College of Engineering will give the degree of Bachelor of Science in one of the branches of engineering.

Institutions cooperating with The University of Tennessee in offering this Liberal Arts-Engineering 3-2 Binary Plan include:

- Belmont College, Nashville, Tennessee
- Bethel College, McKenzie, Tennessee
- Carson-Newman College, Jefferson City, Tennessee
- David Lipscomb College, Nashville, Tennessee
- East Tennessee State University, Johnson City, Tennessee
- King College, Bristol, Tennessee
- Knoxville College, Knoxville, Tennessee
- Monroe College, Maryville, Tennessee
- Middle Tennessee State University, Murfreesboro, Tennessee
- Tennessee Wesleyan College, Athens, Tennessee
- Union University, Jackson, Tennessee

Questions about courses to be taken in preparation for transfer to The University of Tennessee may be directed to the Dean of Engineering.

Graduate Program 

GENERAL 
Graduate programs leading to the degree of Master of Science are offered in all areas of study, and the degree of Doctor of Philosophy is offered in eight major subjects: aerospace engineering, chemical engineering, electrical engineering, engineering science, mechanical engineering, metallurgical engineering, nuclear engineering, and polymer engineering. A Master of Engineering degree focusing on engineering design and professional practice is offered in aerospace, civil, electrical, environmental, industrial, mechanical, and nuclear engineering. Information concerning graduate programs is given in the Graduate Catalog.

MASTER OF SCIENCE PROGRAM IN ENGINEERING ADMINISTRATION 
A program leading to the degree of Master of Science with a major in engineering administration is offered with the aim of providing education for graduate engineers in the organization and direction of work in engineering functions, at a level which requires understanding of such areas as marketing, finance, and industrial relations. It must be emphasized that this is an engineering program, directed toward preparing individuals for line management positions in construction, design, development, manufacturing, and where both technical and non-technical factors exert significant influence on the success of a given activity. The program does not provide the opportunity for in-depth study of any of the traditional areas of business administration, and students with such interests are advised to consider graduate programs available in the College of Business Administration. Policy direction and administration of the program are provided by an Engineering Administration Committee, consisting of representatives from participating departments in the College of Engineering and Business Administration, and a chairman appointed by the Dean of Engineering. Further information is provided in the Graduate Catalog.

Graduate Program at the UT Space Institute 
At The University of Tennessee Space Institute near Tullahoma, graduate-level courses are offered in engineering fields such as aerospace, electrical, and mechanical engineering, and in mathematics and physics. Current programs lead to the M.S. and Ph.D. degrees. Many members of the faculty of the Space Institute are also members of the faculty of the College of Engineering.

Engineering Experiment Station 
F.N. Peebles, Director 
William K. Stair, Associate Director 

The management of the Engineering Experiment Station is vested in the President of the University, the Dean of Engineering, the Director, and the Associate Director. 

An advisory committee consisting of the heads of the departments of the College of Engineering and the heads of departments in allied scientific fields may assist in determining policy and procedures. Members of the faculty of the College of Engineering are available for consultation and advice in technical matters. 

The Station is organized to conduct research underlying engineering practice and to aid in the development of the state's resources and industries insofar as
funds available will permit. Inquiries from industries concerning technical questions which interest them are welcomed. The Station may also make special arrangements with any person or company to study any technical question within the capacity of its resources, and to report the results exclusively to the company requesting the study. In such case, the whole expense will be carried by the parties requesting the investigation. Bulletins are published from time to time giving the results of various investigations. Upon request, unpublished results of current studies are made available to interested parties.

Curricula in Engineering

NATIONAL ACCREDITATION

Since 1936 engineering programs at institutions of higher learning have been accredited by the Engineers Council for Professional Development, an organization formed by many engineering societies. Currently accredited engineering curricula at UT include agricultural, chemical, civil, electrical, engineering science, industrial, mechanical, metallurgical, and nuclear. The advanced professional programs are also accredited in civil, electrical, environmental, mechanical, and nuclear engineering.

COURSE LOAD

The maximum number of hours which can be taken by an undergraduate without special permission is 19 hours. The Dean of Engineering must give permission to take 20 hours or more.

GENERAL REQUIREMENTS

NOTE: Students are advised to consult the University’s degree requirements as stated in the front section of this catalog as well as the requirements for the college or department.

Inspection Trip. Each candidate for graduation majoring in aerospace, mechanical, chemical, or metallurgical engineering must participate in inspection trips scheduled by the major department.

Transfer Credit. Every attempt will be made to give maximum credit for courses taken elsewhere and transferred to the College of Engineering. Discussions concerning the evaluation of transfer credits should be conducted with the head of the department into which the student proposes to transfer following the evaluation of transfer credits by the Admissions Office.

Program for Second B.S. Degree. Upon approval by the Dean of Engineering and the Committee on Degrees of a program of study recommended by the major engineering department, a student who already holds a bachelor’s degree may obtain the appropriate first degree in engineering upon completion of a minimum of 45 quarter hours credit. The prevailing University regulations on residence and quality point averages shall apply.

SATISFACTORY/NO CREDIT COURSES. An undergraduate engineering student may count toward a degree up to 12 quarter hours obtained by Satisfactory/No Credit (S/N/C) grading. Such courses must be suitable for humanistic-social (non-technical) elective credit in engineering.

HUMANITIES AND SOCIAL STUDIES ELECTIVES. The College of Engineering assumes an obligation to include in each of the engineering curricula a means whereby students gain greater insight into their interaction with society, both personally and professionally. For this purpose, a part of each engineering curriculum is devoted to humanities and social studies electives. Broadly stated, these electives serve a three-fold need: to provide an expanded view of the human aspects of the practice of engineering; to enrich the student’s knowledge of the world in which he or she lives—its culture, behavior patterns, history and governance; and to provide a basis for the appreciation of and the ability to deal with complex interactions between technology and society in the contemporary world. The significance of this interaction is becoming progressively more significant. Future engineers are now working with new constraints that demand a consciousness of the social and political implications of their work. They are interacting more with the public in explaining their work as the public demands greater participation in the decision-making process concerning the utilization of technology. Because of the significance of this technology-society interaction, engineering students are encouraged to seriously consider their selection of required electives in this area.

Students are encouraged to plan to take non-technical electives programs which will enhance their own interests and objectives. It is recognized that, just as engineers show individual preference for concentration in one of the areas of engineering, they differ in their interests in the many areas of the humanities and social sciences. However, considerable personal satisfaction results if subject areas outside one’s major discipline can be pursued with sufficient depth in terms of courses to permit a reasonable level of confidence in the comprehension of the selected areas. In order to increase the effectiveness of this interest and to meet accreditation guidelines, the Humanities and Social Studies Electives Committee of the College of Engineering provides a list of approved courses in the form of thirteen coherent groups of courses identified in three broad areas as follows:

Area I. Human, Economic, and Political Relationships to Engineering

A. Governance and Political Science
B. Economics
C. Sociology and Psychology

Area II. Society—Its Culture, History and Literature

A. Fine Arts
B. American Culture
C. History
D. Literature
E. Anthropology

Area III. Technology and Society

A. Human Habitat
B. Technology Assessment
C. Communication
D. Resources

Courses in the list which follows are selected by the Committee with revisions as course offerings and needs change. They are recommended as satisfying the non-technical (humanitarian-social) electives requirement in the various curricula of the College. However, the structure and permissible courses of the non-technical electives content of each engineering curriculum is established by the respective departments. Therefore, individual departments may delete courses from this list, require certain courses, or require selection of courses from specific subgroups. Students should consult their departments for any restrictions.

It is recognized that individual students may desire to take courses not on the approved list. Those students should discuss their interests and desires with their academic adviser prior to registering for elective courses if such courses are to be used to satisfy degree requirements. Also, the catalog may state prerequisites for upper-division courses in the list. In such cases, students are encouraged to consult the instructor in the particular course, since prerequisites might be waived. With reasonable authority, deviations from this list are handled by means of a substitution sheet which originates with the adviser.

ELECTIVE OPTIONS IN HUMANITIES AND SOCIAL STUDIES

Area I. Human, Economic, and Political Relationships to Engineering

IA. Governance and Political Science
   Business Law 4110
   Economics 3340
   Geography 3610
   History 3795, 4311-21, 4370, 4380
   Political Science 2510-20, 3545-46, 3710-20, 3750-60, 3801-02-03-04, 4535-36, 4540-50, 4655-66, 4940
   Sociology 3030, 3420, 4330, 4530

IB. Economics
   Economics 2110-20-30, 2118-28-38, 3120, 3220, 3240
   Geography 2110-20-30, 3410, 4610
   Geology 2310
   Industrial Management 4320

IC. Sociology and Psychology
   Geography 3000, 3600, 3660
   Journalism 4410
   Psychology 2500, 3120, 3220, 4460, 4610, 4900
   Sociology 1510, 1520, 3030, 3150, 3410, 3610, 3620, 4330, 4560

ID. Human Values
   Geography 3000
   History 4640-50-60
   Philosophy 2310, 2410, 3111-21-31-41, 3311-12, 3440, 3690, 3910
   Religious Studies 2610, 3550

Area II. Society—Its History, Culture, and Literature

IA. Fine Arts (Note: No more than 8 quarter hour credits may be taken in the performing arts—voice, instrumentation, band, chorus, etc.)
   Art 1815-25, 3735, 3736, 3745, 3746, 3756, 3810
   English 2660, 3411-12-20-30
   Music 1xxx (applied music, ensemble, etc.)
   Music 1210-20, 1340, 2310-20-30-40, 3350
Area III. Technology and Society

III.A. Human Habits
Agricultural Economics 4330
Anthropology 4430
Botany 3090
Geography 3490, 3520, 3530, 3600, 3910
Journalism 4410
Nutrition 2000
Political Science 4940
Psychology 4900
Public Health 3320
Sociology 1510-20, 3130, 3410, 3420, 3610, 4030, 4110, 4320, 4330, 4510, 4610

III.B. Technology Assessment
Biology 3130
Botany 3090
Economics 3240, 4260
Geography 2110-20-30, 3430, 3490, 3940, 4240
Geology 2310, 3510
Nuclear Engineering 3040
Philosophy 3720, 3770
Political Science 3801-02-03-04, 4940
Psychology 4900
Rural Sociology 4450
Sociology 3610, 4110, 4330, 4610
University Studies 3010, 4100

III.C. Communication
Broadcasting 3650 or Journalism 2210
Journalism 3110, 3710, 3720, 4410
Philosophy 2510-20
Sociology 3010
Speech 2311, 2331, 3011, 3021

III.D. Resources
Economics 4260
Forestry 3730
Geography 2110-20-30, 3490
Geology 2310
Nuclear Engineering 3040
University Studies 3010, 4110

American History Requirement
Engineering students, regardless of national origin, graduating in August 1978 or thereafter, must fulfill the American history requirement described on page 129.
Before entering the third quarter of the junior year, the student, with the aid and approval of the adviser, must select a program of technical electives.

Junior
Aero. Engr. 3430.......................... 1
Aero. Engr. 3511.......................... 4
Aero. Engr. 3610-20...................... 3
Aero. Engr. 3630-40...................... 3
Mech. Engr. 3110-20-30.................. 3
Engr. Sci. & Mech. 3320.................. 3
Mech. Engr. 3311, 3321-30................ 3
Mech. Engr. 3410.......................... 3
Mech. Engr. 3440, 4420.................. 3
Mech. Engr. 3910.......................... 3
*Humanities/social studies electives.......................... 3

Senior
Aero. Engr. 4210-50-60.................. 3
Aero. Engr. 4230, 4510, 4530............. 3
Aero. Engr. 4471-91...................... 3
Aero. Engr. 4510-20........................ 1
Civil Eng. 3080-90........................ 4
*Technical electives.......................... 3
*Humanities/social studies electives.......................... 6

TOTAL: 202 hours

*Humanities/social studies electives: minimum of 20 hours required.
*Technical electives: upper-division courses in engineering, mathematics or physical science as approved by the department.

Agricultural Engineering
(See College of Agriculture Section.)

Biomedical Engineering
Available in Engineering Science Degree Program

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<td>Sophomore</td>
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<tr>
<td>Mathematics 2840-50-60</td>
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<tr>
<td>Physics 2310-20-30</td>
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<tr>
<td>*Biology 3120 and 3120</td>
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<tr>
<td>Engr. Sci. &amp; Mech. 3410, 3700, 3110</td>
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<tr>
<td>*Humanities/social studies electives.......................... 4 4 3</td>
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Junior
*Chemistry 3211-21-31, 3219-29-39 | 4 4 4 |
| Elect. Engr. 3110-20             | 3     |
| Chem. Engr. 3110-20-30           | 3 3 3 |
| Engr. Sci. & Mech. 3311           | 4     |
| Computer Science 3150            | 4 3 3 |
| Math. Eng. 3440 or 3540          | 4     |
| Mathematics elective              | 3     |
| Engr. Sci. & Mech. 3120 or 3320  | 3 3 3 |
| *Humanities/social studies electives.......................... 3 3 3 |

Senior
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<tr>
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<tr>
<td>Engr. Sci. &amp; Mech. 4010</td>
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<td>Zoology 3050 or 3050</td>
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<tr>
<td>*Engr. sci. electives</td>
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<tr>
<td>*Teaching Career</td>
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<tr>
<td>*Humanities/social studies electives.......................... 8 8 8</td>
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TOTAL: 198 hours

*Humanities/social studies electives: minimum of 20 hours required.

Chemical Engineering

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<tr>
<td>Math 1840-50-60</td>
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<tr>
<td>English 1510-20</td>
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<tr>
<td>Chemistry 1110-20-30</td>
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<td>Graphics 1110-20-30</td>
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Sophomore
*Chem. Engr. 2010-20-30         | 4 4 4 |
| Chem. Engr. 2011                | 4 4 4 |
| Chem. Engr. 3410                | 4 4 4 |
| Chemistry 2140-49               | 4 4 4 |
| Math 2840-50-60                 | 4 4 3 |
| Engr. Sci. & Mech. 2720         | 4 4 4 |
| *Non-technical electives        | 3 3 3 |

Junior
*Chem. Eng. 3420-40              | 4 3 3 |
| Chem. Engr. 3010                 | 3     |
| Chem. Engr. 4110, 3610           | 4     |
| Chem. Engr. 3040-50              | 4     |
| Chemistry 3211-19, 3221-29      | 4 4 4 |
| Math 3150                       | 4 3 3 |
| Elect. Engr. 3110 and 3120 or 3130 | 3|
| Meth. Engr. 3150                | 3 3 3 |
| *Non-technical electives        | 4     |

TOTAL: 200 hours

Electrical Engineering

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<tr>
<td>Math 1840-50-60</td>
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<td>English 1510-20</td>
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<td></td>
</tr>
<tr>
<td>Graphics 1310-20-30</td>
<td>4 4 4</td>
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<tr>
<td>Basic Engr. 1310-20-30</td>
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</tr>
<tr>
<td>Basic Engr. 1410</td>
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</tr>
<tr>
<td>*Non-technical electives</td>
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Sophomore
Math 2840-50-60                  | 4 4 4 |
| Physics 2310-20-30              | 4 4 4 |
| Elect. Engr. 2010-20-30         | 3 3 3 |
| Math 3150                       | 3 3 3 |
| Engr. Sci. & Mech. 3710 or 3130 | 3 3 3 |
| *Non-technical electives        | 4 4 4 |

Junior
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<tr>
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<td>Elect. Engr. 3040-50-60</td>
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<tr>
<td>Elect. Engr. 3010, 3720, 3100</td>
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<td>Elect. Engr. 3190, 3180</td>
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<td>Mech. Eng. 3520-30-40</td>
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<td>Elect. Engr. 3080-90</td>
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<tr>
<td>Math 3150</td>
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*Humanities/social science courses approved by the department.
*Mechanical Engineering 3520 or 3311 may be substituted.
*Math/science courses approved by the department.
*Technical electives must be approved by the student’s adviser and the primary and one secondary area of study must come from the departmental list of approved courses for 15 credits and 6 credits respectively.

During the third quarter of the junior year the student, in consultation with the adviser, should choose one of the following areas of interest. Courses marked with footnote 1 may be replaced by other courses approved by the student’s area adviser.

Notice that any given senior course is offered only once every third quarter including the summer quarter.

SENIOR YEAR—AREAS OF INTEREST

Electromagnetic Fields and Energy

<table>
<thead>
<tr>
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<td>Elect. Engr. 4110</td>
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<td>Elect. Eng. 4570</td>
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<td>Elect. Eng. 4080</td>
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TOTAL: 202 hours

Energy Conversion and Power Systems

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<tr>
<td>Elect. Engr. 4370</td>
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<tr>
<td>*Elect. Eng. 4790</td>
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<td>3 3 3</td>
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<td>*Elect. Eng. 4780</td>
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<td>*Nuclear Eng. 4610</td>
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TOTAL: 202 hours
Plasma and Electro-Optics Engineering

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<td>Elect. engr. tech. electives</td>
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<td>Non-technical electives</td>
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Systems and Networks

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<td>Economics 2110</td>
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Computer Engineering

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Electronics and Instrumentation

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Electrical Option

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Engineering Physics

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Industrial Engineering

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Engineering Science

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Bioelectric Option

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Mechanical Engineering

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Before entering the third quarter of the junior year the student, with the aid and approval of an adviser, must select a program of mechanical engineering and technical electives. The following areas of specialization are available in the senior year: Energy, Environmental, Manufacturing, Machine Design, Propulsion and Aerospace. See page 154.
### Metallurgical Engineering

**Freshman**

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**Sophomore**

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**Junior**

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**Nuclear Engineering**

**Freshman**

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**Sophomore**

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**Senior**

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TOTAL: 202 hours

*Not required in the cooperative program.
*A minimum of one-half (12 quarter hours) of the non-technical electives must be taken from a single group under one of the three areas of the humanities and social studies electives.

TOTAL: 195 hours

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**Junior**

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TOTAL: 195 hours

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*Humanities/social studies electives: minimum of 20 hours required.
*Mechanical engineering electives: senior courses in mechanical engineering not otherwise required.
*Technical electives: upper-division courses in engineering, mathematics, or physics as approved by the department.
### Cooperative Curriculum in Aerospace Engineering

#### Students Working Spring and Fall Quarters—Group A

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**TOTAL:** 202 hours

### Students Working Summer and Winter Quarters—Group B

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**TOTAL:** 202 hours

*Humanities/social studies electives; minimum of 20 hours required.

*Technical electives; upper division courses in engineering, mathematics or physical science as approved by the department.*
# Cooperative Curriculum in Agricultural Engineering (See College of Agriculture Section)

**Cooperative Curriculum in Chemical Engineering**

*Students Working Spring and Fall Quarters—Group A*

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**TOTAL: 199 hours**

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**Students Working Summer and Winter Quarters—Group B**

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**TOTAL: 199 hours**

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1. A minimum of one-half (12 quarter hours) of the non-technical electives must be taken from a single group under one of the three areas of the humanities and social studies electives.
Cooperative Curriculum in Civil Engineering
Students Working Spring and Fall Quarters—Group A

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TOTAL: 200 hours

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Students Working Summer and Winter Quarters—Group B

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Fifth Year

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TOTAL: 200 hours

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1*Humanities/social studies courses approved by the department.
2*Math/science courses approved by the department.
3*Technical electives must be approved by the student's adviser and the primary and one secondary area must come from the departmental list of approved courses for 15 credits and 6 credits respectively.
4*Mechanical Engineering 3520 or 3311 may be substituted.
Cooperative Curriculum in Electrical Engineering  

Students Working Spring and Fall Quarters—Group A

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FIFTH YEAR  See Senior Year Areas of Interest, page 130.
## Cooperative Curriculum in Engineering Physics

**Students Working Spring and Fall Quarters—Group A**

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**TOTAL: 198 (199) hours**

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## Students Working Summer and Winter Quarters—Group B

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**TOTAL: 196 (199) hours**

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*To be taken from Liberal Arts Triads of Language, Literature and Arts, or History and Society, with at least 16 hours from courses approved for Language, Literature and Arts.
*The honors sequence (Physics 1318-28-38) is recommended for qualified majors.
*To be taken in College of Engineering.
*From engineering, mathematics, computer science, physics, chemistry, or astronomy.
*Students not planning to pursue graduate studies may substitute 3710-30-30.
### Cooperative Curriculum in Engineering Science

**Students Working Spring and Fall Quarters—Group A**

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1Humanities/social studies courses approved by the department.
2Appropriate courses approved by the department.
3Appropriate courses in the College of Engineering approved by the department.
4Upper-division courses in mathematics, statistics, natural science, or engineering approved by the department.
## Cooperative Curriculum in Industrial Engineering

### Students Working Spring and Fall Quarters—Group A

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TOTAL: 205 hours

### Students Working Summer and Winter Quarters—Group B

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TOTAL: 205 hours
### Cooperative Curriculum in Mechanical Engineering

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**TOTAL: 202 hours**

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**TOTAL: 202 hours**

*Humanities/social studies electives: minimum of 20 hours required.
*Mechanical engineering electives: senior courses in mechanical or aerospace engineering not otherwise required.
*Technical electives: upper-division courses in engineering, mathematics or physics as approved by the department.
### Cooperative Curriculum in Metallurgical Engineering

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**TOTAL: 198 hours**

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**TOTAL: 198 hours**

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1 A minimum of one-half (12 quarter hours) of the non-technical electives must be taken from a single group under one of the three areas of the humanities and social studies electives.
### Cooperative Curriculum in Nuclear Engineering

**Students Working Spring and Fall Quarters—Group A**

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### Students Working Summer and Winter Quarters—Group B

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Agricultural Engineering
(See College of Agriculture)

Basic Engineering and Graphics
(Non-Departmental Unit)

Basic Engineering (179)
Coordinator: W.T. Snyder

1310 Basic Mechanics I (4) Forces, vector quantities, and moments; resultant forces of force systems; static equilibrium. Required of all engineering students except engineering physics majors.
Coreq: Math 1840. 3 hrs and one 3-hr lab.

1200 Basic Mechanics II (4) Displacement vectors; particle kinematics and projectile motion; kinematics of particles using Newton's laws, frictional forces, and impulse-momentum. Required of all engineering students except engineering physics majors.
Prereq: 1310; coreq: Math 1850. 3 hrs and one 3-hr lab.

1410 Engineering Computations (2) Presentation of data; elementary problem solving; use of slide rule and digital computer; treatment of error; empirical methods.
Coreq: 1310. 2 hrs plus open computation lab.

Graphics (443)
Coordinator: J.N. Snider
Professor: C.A. Newton (Emeritus), M.S. Syracuse.
Associate Professors: E.K. Boyce, M.S. Tennessee; W. Lyons, Jr., M.S. Tennessee.

1310-20 Fundamentals of Engineering Graphics (2, 2) Graphic representation of three-dimensional shape and size by orthographic and pictorial projection; sketching and dimensioning; tolerances. Problem solving utilizing spatial relationships and graphical vector analysis, and graphic presentation of engineering data. Must be taken in sequence. Two 3-hr periods or three 2-hr periods.

1410-20 Fundamentals of Engineering Graphics (3, 3) Graphical representation of three-dimensional shape and size; space relationships. Graphical presentation of engineering data. Required of all engineering students. Must be taken in sequence. One lecture and three 2-hr periods or two 3-hr periods.

1415-25 Fundamentals of Engineering Graphics (3, 3) Graphical representation of three-dimensional shape and size; space relationships. Graphical presentation of engineering data. Self-study course with tutorial assistance for those who have had high school mechanical drawing and/or other related experience. Admission by consent of coordinator. Must be taken in sequence. May be interchanged with Graphics 1410-25 courses.

Engineering Studies
(Non-Departmental Unit)

Engineering Studies (338)
Coordinator: E.E. Stansbury

2100 Introduction to Engineering Methodology (4)
Designed to introduce non-engineering students to representative methods utilized in engineering design, development, operation, and evaluation of processes and products for society; use of physical laws and examples of techniques such as modeling, design, systems analysis, economic balances, problems of resource use and technology control; thematic approach may be used.

4100 History of Engineering (4)
History of technology and engineering with emphasis on identification of and developments in major areas such as transportation, communication, energy, manufacturing, design, and materials. Relationship to social and political structures of historical periods. Open to all students.

4200 Technology Forecasting and Assessment (4)
Procedures and problems in forecasting of consequence of existing and new technologies; assessment of and decisions on use of these technologies. Social, political, economic, and technological impact of consequence-based assessment and control of technology. Open to all students.

4300 The Interaction Between Science and Engineering (4)
Historical and current analysis of interactions between science and engineering—patterns of mutual stimulation and of distinction. Open to all students.

Chemical, Metallurgical and Polymer Engineering


Assistant Professors: D.D. Burns, Ph.D. Houston; P.J. Meschter, Ph.D. Pennsylvania.

*Alumni Distinguished Service Professor
**Distinguished Professor
*Space Institute, Tulahoma

BACHELOR OF SCIENCE PROGRAM

Separate complete curricula are offered in chemical engineering and in metallurgical engineering. However, the first two years of these curricula are identical and a decision as to choice can be made in the third year. Both curricula are arranged to provide a central core of courses with flexibility in the upper-division years to permit emphasis on preparation for graduate study or technical employment.

GRADUATE STUDY PROGRAMS

Graduate programs leading to the degrees of Master of Science and Doctor of Philosophy with majors in chemical engineering, metallurgical engineering or polymer engineering are offered.
A program leading to the M.S. and Ph.D. degrees with specialization in polymer sciences and engineering in chemical engineering is conducted jointly with the Department of Chemistry which offers a degree with similar specialization.
These programs have been strengthened by fellowships or grants provided by industrial companies including Dow, DuPont, General Electric, Shell, Texaco, Procter and Gamble, Celanese, Monsanto, American Enka, Union Carbide, Stauffer, Owens Corning, Cities Service, and Eastman Kodak, and by graduate fellowships and traineeships provided by National Science Foundation. Other aid to students has been available through research assistantships on contracts with industry and governmental agencies. The University's Graduate School operates a Resident Graduate Program at Oak Ridge, Kingsport, and Chattanooga.
See the Graduate Catalog for detailed information.

Chemical and Metallurgical Engineering (227)


2011 Sophomore Inspection Trip (0) Inspection trip to industrial plant. Usually scheduled in fall on ETEN day. Required for chemical engineering and metallurgical engineering majors. S/N/C.


2030 Process Principles and Materials III (4) Materials structure—property relationships for metals, inorganic and organic compounds, with emphasis on mechanisms of control of properties by chemical composition, thermal and mechanical treatment; crystallography, imperfections, mechanical properties, heat treatment, molecular weight and particle size distributions. Prereq: 2010; Chemistry 1130. 3 hrs and 1 lab period.

2220 Analog Computer Practice (1) Introduction to fundamentals of analog programming. Analog computer facilities and analog simulation languages will be emphasized. Prereq: Math 2840; Physics 2310 or Elec. Engr. 3110 or consent of instructor. One lab. S/N/C.

2230 Mini Computer Practice (1) Use of mini computers. Prereq: Basic Engineering 1410, or consent of instructor. One lab. S/N/C.

2240 Mini Computer Data Acquisition (1) Mini computers for data acquisition. Prereq: 2230 or consent of instructor. One lab. S/N/C.

3040 Process Principles and Materials IV (4) Applications of the second law of thermodynamics to physical and chemical processes and thermodynamics of solutions. Application of the Gibbs function in one, two and three phase chemical systems; use of tabular and graphical data in equilibrium calculations. Prereq: 2020; Chemistry 1130; coreq: Math 2840. 3 hrs and 1 lab period.

3100 Introduction to the Materials of Technology (4) Examination of sources, processing, and prop- erties of metallic, ceramic, polymeric, and com- posite materials based upon an historical per- spective and current practices in technology. Architectural, industrial, art, and educational applications. Open to students in all colleges. Prereq: Introductory science course.

4310-20 Seminar (1, 1) Presentation and discussion of economic, political, humanistic, and other topics related to chemical and metallurgical engi- neers. S/NC.

Chemical Engineering (226)

3010 Industrial Inspection Trips (1) Technology of chemical process industries emphasizing Tennes- see industry, plant trips. S/NC.

3410 Flow of Fluids (4) Differential and overall mo- mentum, balance, energy, and thermodynamic energy balances; flow in tubes, piping systems, and packed beds; metering devices, pumps. Prereq: Chemet. Engr. 2020, Math 2850. 3 hrs and 1 lab.

3420 Heat Transfer (4) Differential and overall energy balances; steady and unsteady state; heat conduction in simple geometries; heat transfer in tubes and heat exchangers; condensation and boiling; radiative heat transfer. Prereq: 3410. 3 hrs and 1 lab.


4500 Diffusional Operations (3) Diffusion simulta- neous heat and mass transfer, applications in- cluding humidification, gas absorption, extraction. Prereq: 3420, Chemet. Engr. 3040.

4810 Introduction to Process Dynamics and Con- trol (3) Introduction to concepts of process dynamics and control. Steady-state analysis of chemical process control systems. Unsteady state. Prereq: Chemical engineer- ing of chemical processes, LaPlace transform techniques, block diagram algebra and transfer functions. Mathematical models for several processes are developed and analyzed in detail. Prereq: Mathematics 2840.

3620 Chemical Process Control (3) Basic control theory applied to chemical processes: feedback control systems, cascade control, feed-forward control, stability analysis, frequency response. Prereq: Survey of modern control of typical industrial unit operations. Prereq: 3610.

4010-20 Thesis (3, 3) Investigation and report of elementary chemical engineering problem.

4110 Chemical Engineering Data Analysis (3) Ana- lytical and experimental identification of system properties; regression analysis; sampling and source systems; empirical modeling of processes; statistical process control. Prereq: 3420, Math 3150.


4130 Introduction to Optimization (3) Principles and techniques of optimization techniques to chemical process design; unconstrained optimization, equality constrained optimization, inequality constrained optimization, and dynamic program- ming. Prereq: Math 2840.

4220 Chemical Engineering Laboratory (3) Labora- tory investigations of controlling factors in chemi- cal engineering operations. Prereq: 3440-50, 3620, 4530.

4230 Project Laboratory (3) Laboratory investiga- tion of chemical engineering problem, stressing techniques of group effort.


4420 Process Design and Economic Analysis (3) Development of basic information on a process into an integrated plant design considering mass and energy balances. Product specifications, equipment characteristics, capital investment, operating costs and economic merit. Prereq: 4410, 4530.

4430 Special Problems in Design and Economics (3) Extension of 4420 for student participation in A.I. Ch. E. Design Laboratory; other advanced design projects. Prereq: 4420.

4450 Hydrocarbon Processing (3) Study of special- ized characterization of physical properties of fossi fuel raw materials and products, and of proc- esses for conversion of fossil fuel raw materials into products needed in industrial energy, indus- trial raw material and consumer markets. Prereq: 3440.

4470 Sulfur Removal from Coal and Associated Problems (3) Chemical and physical properties of domestic coals, sulfur distributions; beneficiation by both physical and chemical methods; fluidized bed combustion with both natural and synthetic SOx sorbents; stack gas SOx scrubbing. Prereq: Consent of instructor.

4480 Coal Processing to Liquid Fuels (3) Charac- terization of various coals with respect to current liquefaction methods; modeling of conversion processes and estimation of maximum yields; water and oxygen requirements; pyrolysis; cata- lytic hydrogenation; reactor design considera- tions; review and critique of selected articles from both the coal liquefaction and patent. Prereq: Consent of instructor.


4540 Fluid-Solid Operations (3) Heat and mass transport in fixed and fluidized beds; applications include adsorption, ion exchange, crystallization. Prereq: 3440-50.

4620 Process Modeling, Simulation and Control of Chemical Processes (3) Development of process models, experimental process identification, process computer simulation, conventional and nonconventional feedback control, advanced con- trol concepts. Prereq: 3620 or equivalent back- ground in basic control theory and differential equations.

4730 Mass and Energy Flow in Biological Systems (3) Basic physicochemical and organizational prin- ciples among living systems. Deriva- tions of general equations of biomass and energy transfer. Thermodynamics of transport and equi- librium in the living system. Discussion of Vol- terra's equation and biological clocks, etc. Prereq: Consent of instructor.

4740 Introduction to Transport Phenomena in Biological Systems (3) Application of principles of transport phenomena to biological systems. Trans- fer of chemical energy and various cellular active transports; structure and rheology of physiological fluids, membrane and interfacial phenomena; analysis and design of artificial organs. Prereq: 3440 and 3450 or consent of instructor.

4750 Microbiological Process Engineering (3) Ap- plication of chemical engineering principles and design concept to microbiological processes; con- sideration of microbial systems, food process- ing and pharmaceutical processes. Prereq: 3440, 4540 or consent of instructor.

4760 Principles of Biochemical Separation (3) Fundamental aspects and similarities of modern biotechnology separation methods; classroom demon- strations, design of production and analytical systems. Prereq: Consent of instructor.

4781-82-83 Topics in Chemical Bioen- gineering (3, 3, 3) Problems of interest in chemical bioengineer- ing. Prereq: Consent of instructor.

4810-20-30 Special Problems in Chemical En- gineering (3, 3, 3) Chemical engineering problems related to recent developments in industrial prac- tice. Prereq: Consent of instructor.

GRADUATE

5000 Thesis

5010 Graduate Seminar (1)

5050 Engineering Analysis (3)

5120 Heat Convection (3)

5130 Methods of Optimization (3)

5210 Process Dynamics (3)

5250 Chemical Process Industry Economics (3)

5310 Thermodynamics of Heterogeneous Equilib- rium (3)

5320 Statistical Thermodynamics (3)

5410-20-30 Research and Design in Chemical En- gineering (3, 3, 3)

5510 Chemical Reactor Design (3)

5610 Stagewise Mass Transfer Operations (3)

5620 Differential Mass Transfer Operations (3)

5810 Mechanics of Viscous Flow (3)

6000 Doctoral Research and Dissertation

6130 Process Optimization (3)

6210 Advanced Diffusional Operations (3)

6250 Venture Analysis in the Process Industries (3)

6310 Thermodynamics of Irreversible Processes (3)

6320 Statistical Thermodynamics of Non-equilib- rium Systems (3)

6410 Stability Phenomena in Chemical Engineer- ing: Discrete Systems (3)

6420 Stability Phenomena in Chemical Engineer- ing: Continuous Systems (3)

6510 Applied Chemical Reaction Kinetics (3)

6520 Catalytic Reactor Design (3)

6610 Special Topics in Chemical Engineering (3)

6710 Process Dynamics (3)

Metallurgical Engineering (679)

2110 Engineering Materials I (3) Introductory course correlating the atomic, crystal, and micro- structure of solids and mechanical, physical, and chemical properties of engineering significance. 3 hrs and 1 lab.

2210 Electron Microscopy (1) Designed to present to science and engineering students a brief intro- duction to the operation of the electron micro- scope and its applications to scientific problems. Prereq: Physics 2310-20. 3-hr lab. S/NC.

3010 Industrial Inspection Trips (1) Technology of metallurgical industries, emphasizing Tennessee industry; plant trips. S/NC.

3110 Engineering Materials I (4) Introductory course correlating the atomic, crystal, and micro- structure of solids with mechanical, physical, and chemical properties of engineering significance. 3 hrs and 1 lab.

3120 Engineering Materials II (3) Extension of 2110 with emphasis on control of mechanical proper- ties of materials by specification of composition, thermal, and mechanical treatment; correlation of resultant properties with service performance. Recommended for mechanical, civil, and industrial en- gineering students.

3130 Engineering Materials III (3) Extension of 2110 with emphasis on control of electrical and mag- netic properties of materials by specification of composition, thermal, and mechanical treatment; correlation of resultant properties with service performance. Suggested for electrical engineering students.
Civil Engineering
Including Environmental Engineering

Graduate work leading to the degree of Doctor of Philosophy with a major in civil engineering is offered. Major fields of study include environmental engineering, structural engineering, transportation, construction management, and water resources. The general requirements for the Doctor's degree are stated in the Graduate Catalog.

Civil Engineering (254)
2280 Engineering Surveys I (3) Accuracy in surveying measurements; analysis of errors; control systems and datums; mapping and subdividing areas. Prereq: Math 1850.
2310 Seminar (1) Presentation and discussion of topics related to civil engineering.
2360 Engineering Surveys II (3) Positioning of construction facilities; modern instrumentation; electronic surveying principles. Prereq: 2280.
3160 Structural Theory (3) Moments of inertia; riveted, bolted, and welded joints; deflection of beams; restrained beams; combined stresses; column theory. Prereq: 3210.
3210 Stresses in Framed Structures (3) Reactions, moments, shears and stresses in trusses and framed structures; fixed loads; influence lines for reactions; moments and shears; and graphic statics. Prereq: Engr. Mech. 3310.
3230 Design of Framed Structures (3) Selection of rolled beams; design of compression and tension members; and fatigue. Prereq: 4410 or registration therein.
3310 Physical Properties of Soils (3) Introduction to soils as a construction material, determination of physical properties of soils. 2 hrs lecture and 1 lab. Prereq: Engr. Mech. 3110 and 3310.
3320 Seminar (1) Presentation and discussion of topics related to civil engineering.
3360 Surveying Practice (3) Route surveying procedures. Two three-hour labs. Coreq: 2360.
3600 Transportation Planning (3) Emphasis on transportation problems and perspectives, roadway, and urban; use of the planning process to establish existing travel patterns, modeling of demand, proposed plans, and their evaluation, and plan implementation. Prereq: Junior standing.
3610 Transportation Engineering (3) Introductory course on design, construction, maintenance and operation of various transportation modes, their guideways and terminals. Prereq: Junior standing.
4110 Concrete Design (3) Reinforced concrete beams and columns; use of standard specifications. Prereq: 3160 and 3710.
4210 Concrete Design (3) Reinforced concrete continuous beams and floor slabs; footings, and retaining walls. Prereq: 4110 and 4410.
4220 Foundations and Substructures (3) Foundation explorations; principles of design of dry and subaqueous foundations. Prereq: 3310.
4230 Legal and Ethical Aspects of Engineering (3) Legal principles underlying engineering work, laws of contracts, torts, agency, real property; problems of professional registration and ethics.

Bachelor of Science Program
The curriculum in civil engineering is designed to provide training in fundamental engineering sciences, certain non-technical subjects and basic subjects in the civil engineering fields to serve as a basis for entrance into civil engineering practice, and/or for graduate study. By use of technical electives (27 hours maximum), a student can specialize as primary or secondary areas of study in construction, environmental engineering, structures, transportation, or water resources. Primary specialization will be shown on student's transcript.

Students are required to maintain a cumulative grade point average of at least 2.00 in all civil engineering and environmental engineering courses taken at The University of Tennessee, Knoxville and used to satisfy the graduation requirements.

Masters of Science and Masters of Engineering Programs
Graduate programs in civil engineering and environmental engineering leading to the degree of Master of Engineering are offered by the College of Engineering and by the Department of Civil Engineering. Students are required to maintain a cumulative grade point average of at least 2.00 in all civil engineering and environmental engineering courses taken at The University of Tennessee, Knoxville and used to satisfy the graduation requirements.
4710 Portland Cement Concrete Mix Design (3) Properties and tests of portland cement concrete, methods of concrete mix design, nondestructive concrete evaluation testing, use of concrete admixtures. 2 lectures and 1 lab. Prereq: 3710

4720 Asphalt and Bituminous Concrete (3) Properties and tests of asphalts and asphaltic mixes, mix design of bituminous concrete. Emphasis on use of asphalt in transportation construction projects. 2 lectures and 1 lab. Prereq: 3710

4731-32 Earthquake Resistant Structure I, II (4, 4) (Same as Architecture 4731-32.)

4800 Introduction to Civil Engineering Systems (3) Methods of modeling civil engineering systems and their specific application to problems of transportation, environment, water resources and materials. Prereq: Senior standing or consent of instructor.

4850 Elementary Structural Matrix Methods (4) (Same as Architecture 4850 and Engineering Science and Mechanics 4850.)

4860 Civil Engineering Systems Design and Management (3) Introduction to basic systems engineering concepts within a civil engineering context; discussion of the role of decision maker and use of optimal principles in engineering planning. Prereq: Computer Science 3150.

4910-20 Special Topics (3, 3) Problems relating to recent developments and current practice in civil engineering. Prereq: Consent of instructor.

GRADUATE

5000 Thesis

5002 Non-Thesis Graduation Completion (3-15)

5110-20 Statically Indeterminate Structures (3, 3)

5140 Statically Indeterminate Structures (3)

5150 Matrix Formulation of Structural Problems (3)

5160 Analysis and Design of Plate Structures (3)

5170 Introduction to Structural Dynamics (3)

5180 Finite Element Structural Analysis (3)

5220 Pavement Design (3)

5240 Advanced Properties of Materials: Cement and Concrete (3)

5250 Advanced Properties of Materials: Bituminous Substances and Mixes (3)

5270 Planning and Transportation (3)

5310 Engineering Practice (3)

5320-30 Engineering Practice Applied to Administration of Engineering Projects (3, 3)

5420 Structural Model Analysis (3)

5430-40-50 Construction Management I, II, III (3, 3, 3)

5460-70 Construction Estimating I, II (3, 3)

5550 Soil Mechanics—Plastic Equilibrium (3)

5560 Soil Mechanics—Elastic Behavior (3)

5570 Soil Mechanics—Seepage (3)

5610 Behavior of Steel Structures (3)

5730 Prestressed Concrete (3)

5740 Behavior of Reinforced Concrete Members (3)

5800 Urban Systems: Engineering and Management I (3)

5805 Urban Systems: Engineering and Management II (3)

5810 Traffic Engineering—Characteristics (3)

5820 Traffic Engineering—Operations (3)

5840 Geometric Design (3)

5850 Functional Design of City Streets and Urban Freeways (3)

5860 Urban Transportation Planning (3)

5870 Public Transit Planning (3)

5890 Traffic Accident Reconstruction (3)

5900 Special Problems in Civil Engineering I (1-9)

5910-20-30 Special Topics (3, 3, 3)

6000 Doctoral Research and Dissertation

6160 Behavior of Steel Bridges and Buildings (3)

6740 Behavior of Reinforced Concrete Beams and Frames (3)

6750 Behavior of Reinforced Concrete Slabs (3)

6830 Traffic Flow Theory (3)

6880 Statewide Passenger Transportation Planning (3)

6870 Future Transit Technology and Research (3)

6880 Planning Models for Transportation Systems I (3)

6900 Planning Models for Transportation Systems II (3)

6910-20-30 Special Topics in Civil Engineering I, II (3, 3)

ENVIRONMENTAL ENGINEERING (344)

3000 Introduction to Environmental Engineering (3) Introduction to man’s interaction with the air, water, and land environment in which he lives; role of engineering in environmental control. Prereq: Junior standing.

3120 Hydraulics (3) Application of basic and developed principles of hydraulics. Flow measurement; flow in closed conduits; uniform and nonuniform open channel flow; pumps and turbines; basic hydrodynamics; flow similitude and models. 2 lectures and one 3-hr lab. Prereq: Engr. Mech. 3110.


4150 Urban Water Management (3) Introduction to urban water modeling; evaluation of optimum urban water policies; formulation of system constraints and basis of decision-making process; management of storm water for beneficial use. Prereq: 3300 and 3330.

4210 Water Resources Engineering Design (3) Elements of water resources structures and systems, including reservoirs, dams, control works, and open channel design. Dam safety control, environmental impact of reservoir projects. Prereq: 3330 or consent of instructor.

4220 Water Resources Engineering Development (3) Multi-objective evaluation procedures for comparing and selecting among water resources development alternatives; achieving project optimality; single- and multi-purpose projects; special topics in new developments in water resources engineering. Prereq: 3330 or consent of instructor.

4330 Hydrologic Design (3) Application of frequency and regression analysis to hydrologic design of water resources system; unsteady surface runoff and streamflow modeling; urban peak runoff design using kinematic wave theory; evaluation of effects of land use changes on stream flow quantity and quality. Prereq: 3330.

4510 Elements of Water and Wastewater Transport Systems (3) Introduction to theory and design of water transportation and distribution systems and wastewater collection systems. Prereq: 3000, 3120 and 3330.

4520 Elements of Water and Wastewater Treatment Systems Design (3) Introduction to unit operations and processes employed in physical, chemical, and biological treatment of water and wastewater. Application of unit operations and processes in the design of water and wastewater treatment plants. Prereq: 3300 and 3337.

4530 Sanitary Engineering Laboratory (3) Physical, chemical, and bacteriological analysis of water and wastewater. 3 labs. Prereq: 4300.

4600 Solid Waste Management (3) Quantities and characteristics of solid wastes; collection methods and equipment; disposal and recycle techniques; economics; planning and management. Prereq: 3000.

4700 Air Pollution-Air Resource Management (3) Introductory course on concepts of air pollution; analysis of relationship among emission sources, meteorology and topographic factors, and adverse effects on receptors; engineering approaches for air pollution control. Prereq: Senior standing.

4810 Water Law (3) (Same as Law 8975 and Water Resources Development 4810.)

4820 Environmental Engineering Law (3) Legal aspects of water and air pollution, drainage, land use controls and environmental impact statements with emphasis upon federal-state relations, recent legislation and court decisions, and enforcement. Prereq: Senior standing.

4910-20-30 Special Topics in Environmental Engineering (3, 3, 3) Problems related to recent developments and current practice in environmental engineering. Prereq: Consent of instructor.

GRADUATE

5000 Thesis

5002 Non-Thesis Graduation Completion (3-15)

5150 Water and Urban Welfare (3)

5160 Planning and Utilities (3)

5200 Water Resources Systems (3)

5210 Advanced Water Resources Engineering (3)

5230 Surface Water Transport Processes (3)

5232 Sediment Transportation (3)

5240 Flood Control Hydraulics (3)

5261 Basic Principles of Remote Sensing (3)

5262 Remote Sensing Data Acquisition (3)

5263 Remote Sensing Data Analysis and Interpretation (3)

5301 Stormwater Modeling I (3)

5302 Stormwater Modeling II (3)

5310 Groundwater Transport Processes (3)

5330 Descriptive Hydrology (3)

5400 Introduction to Environmental Systems (3)

5501 Water and Wastewater Treatment Theory I (3)

5502 Water and Wastewater Treatment Theory II (3)

5513 Advanced Water and Waste Treatment Systems (3)

5530 Environmental Engineering and Natural Systems Behavior (3)

5551 Water Quality Management (3)

5561 Environmental Management of Water Quality (3)

5582 Microbiology for Sanitary Engineers (3)

5583 Advanced Sanitary Engineering Laboratory (3)

5600 Solid Wastes (3)

5610 Solid Waste Disposal (3)
the senior year, the student may specialize in any one of the following areas of electrical engineering: bioelectronic engineering, computer engineering, electromechanical fields and communications, electronics and instrumentation, energy conversion and power systems, plasma and electro-optics engineering.Rents and networks. All of these areas except the bioelectronic engineering option are continued through the M.S. and Ph.D. programs. The senior year curriculum is sufficiently flexible to allow a student to take several courses outside of the chosen area of specialization.

All sophomore and junior course work is offered every quarter and the senior work is scheduled so that the student may enter at the beginning of any quarter. This arrangement allows maximum flexibility, since the student may elect the normal four-year schedule, may choose to graduate in three calendar years, or may take the Cooperative Engineering Program.

In addition to the usual research and teaching facilities in machinery, electronics, microwaves, solid state devices and control equipment, the department has both digital and analog computers.

**MASTER OF SCIENCE PROGRAM**

Graduate work leading to the Master of Science degree may be completed during one academic year of full-time study or the degree may be obtained in two or three years of study in the evening.

Graduate assistantships and scholarships are available for outstanding students. Graduate assistants may obtain the Master's degree in one calendar year.

Course work leading to the degree of Master of Science in Electrical Engineering is offered in the evening. Each course meets for two and one-half hours each week.

**THE DOCTORAL PROGRAM**

Graduate work leading to the degree of Doctor of Philosophy with a major in electrical engineering is offered. The department also participates in the engineering science doctoral program.

General policies of the Graduate School, residence, language, research, examinations, and admission to candidacy requirements are explained in the Graduate Catalog.


**2030 Circuits III (3) Polyphase networks considered as networks with more than one source. Magnetics. Transient analysis of circuits containing more than one storage element using classical methods. Steady-state analysis of networks containing sinusoidal sources of more than one frequency. Coreq: 2020, Math 2850 concurrently. 3 hrs including biweekly lab.**

**3010 Transient Analysis (3) Analysis of transient response of networks and systems; Laplace transform method and differential equation methods for system analysis; complex frequency concept and pole-zero concepts; application to analog computers. Coreq: 3030.**


**3050 Basic Field Theory (3) Forces between charges, electric and magnetic fields, Gauss' Law and divergence, potential and line integrals, material bodies, polarization, magnetic circuits, Maxwell's equations, dynamic potentials. Coreq: Math 2850.**

**3060 Propagation I (3) Plane waves, reflection, guided waves, transmission lines, standing waves, impedance, matching, graphical methods, rectangular wave guides. Coreq: 3050. 3 hrs including biweekly lab.**

**3080 Energy Conversion (3) Magnetic circuits, transformer theory and operation, principles of electromagnetic energy conversion with emphasis on input-output characteristics; steady state analysis of induction motors and d.c. machines. Coreq: 3040. Includes a biweekly lab.**

**3090 Energy System Operation (3) Synchronous machines, transmission lines, and transformers as power system elements; power system representation, per unit calculation, symmetrical components, and fault studies. Coreq: 3080. Includes a biweekly lab.**

**3100 Random Signals and Noise in Engineering (3) Theory of random signals and spectral analysis of noise as applied to engineering problems. Random signal response of linear networks. Transformation of random signals by nonlinear networks. Coreq: 3010 and 3040. 3 hrs including biweekly lab.**

**3110 Basic Electrical Engineering—Circuits and Fields (3) For non-electrical engineering majors. Coreq: Math 2850, Physics 2310-20. 3 hrs including biweekly lab.**

**3120 Basic Electrical Engineering—Electronics (3) For non-electrical engineering majors. Coreq: 3110. 3 hrs including biweekly lab.**

**3130 Basic Electrical Engineering—Machine (3) For non-electrical engineering majors. Coreq: 3110. 3 hrs including biweekly lab.**

**3135 Basic Electrical Engineering—Instrumentation (3) For non-electrical engineering majors. Coreq: 3110. 3 hrs including biweekly lab.**

**3180 Logic Design of Digital Systems (3) Introduction to boolean algebra and design of combinational and sequential circuits. Presents gate and flipflop characteristics. Design of clocked sequential circuits and other systems containing memory. Introduction to minicomputer architecture and system components to include basic structure and function of Arithmetic, Storage, Input/Output, and Control Systems. Instruction set capabilities and machine language programming. Coreq: 3101, Computer Science 3156. 3 hrs including biweekly lab.**

**3190 Plasma I (3) Engineering applications of plasma and electronics. Basic plasma effects and devices. Topics include electrostatic precipitators and plasma light sources, laser operation and applications (non-optical), and MHD, controlled thermonuclear and other techniques of advanced engineering.**
power production. 3 hrs biweekly lab. Prereq: Physics 2310-20-30.

3720 Linear Systems Analysis (3) Steady-state and transient response; log-frequency, gain-phase, and Bode diagram transformations; signal flow graphs; analogoust systems, properties of second order systems; introduction to feedback theory and stability. Prereq: 3010 and Mathematics 3150; coreq: 3180. 3 hrs including occasional labs.

3810 Electronics I—Basic Electronic Processes (3) Characteristics and equivalent circuits of vacuum tubes and transistors with application to amplifier and control circuits. Prereq: 3810. 3 hrs including biweekly lab.

3820 Electronics II—Basic Electronic Devices (3) Characteristics and equivalent circuits of vacuum tubes and transistors with application to amplifier and control circuits. Prereq: 3810. 3 hrs including biweekly lab.

3830 Electronics III—Basic Electronic Amplifiers (3) Vacuum tube and transistor R-C coupled amplifiers; tuned amplifiers; basic power amplifiers; bias stability, feedback. Prereq: 3810 and 3820; coreq: 3720. 3 hrs including biweekly lab.

4020 Direct Electrical Energy Conversion (3) Basic principles, typical devices and applications for production of electrical energy by thermoelectric effects, fuel cells, photovoltaics, electrochemical energy sources, solar cells, and fuel cells. Laboratory demonstrations. Prereq: 3050, 3190 and 3810.

4080 Microwave Circuits and Electronics (3) Circuits, transistors, oscillators, semiconductor diodes, tunable and variable capacitors, magnetic cores, and tunable oscillators. Prereq: 3600. 3 hrs including biweekly lab.

4090 Propagation II (3) Metal tube, dielectric rod, and stripline waveguides. Waveguide resonators and other loading components. Design of structures utilized for microwave power transmission and for microwave integrated circuits. Prereq: 3060. 4 labs.


4200 Electromagnetic Field Transients (3) Pulse propagation on lines, reflection of pulses, time domain reflectometry, radiation of pulses from antennas. Prereq: 3190 and 3270. Opt for optional.


4370 Introduction to Feedback System Design (3) Mathematical formulation of control systems; steady-state error and error constants; root-locus methods; optimum gain adjustment; compensation network connection to compensation. Prereq: 3270. Lab optional.

4410 Power System Components and Control (3) Analysis of power system components and their interconnection. Studies in control of power and frequency as well as voltage and reactive power. Prereq: 3090.

4420 Power Systems Analysis (3) System studies including load flow, faults, and stability. Prereq: 3090.

4430 Transmission, Distribution, and Protection (3) Studies in underground and d. c. transmission; consideration of over-voltages and insulation requirements; system protection against faults. Prereq: 3090.

4460 Lasers and Masers (3) Principles of laser and maser operation based on classical concepts and electrical engineering analogies. Consideration of practical devices and applications. Prereq: Senior standing.

4470 Plasma II (3) Magnetohydrodynamics. Prereq: 3190.

4480 Plasma III (3) Macroscopic plasma equations, particle orbits, interactions, oscillations and waves. Prereq: 3190.


4500 Electro-Optic Detection and Instrumentation (3) Sensitivity, resolution (frequency response) and noise concepts of and practical engineering data for both spatial recording media (e.g. photographic emulsions) and temporal detectors (e.g. photodiodes) will be given. Last third of the course will be devoted to selected electro-optic instrumentation systems (e.g. laser light scattering, optical data processing, holographic interferometry).


4570 Acoustic-Oscillators (3) Reproduction of monophonic and stereophonic sound, microphones, loud speakers, disc recording, magnetic record-ings, film recording, acoustics of studios, auditoriums. Prereq: Senior standing.

4600 Instrumentation Transducers and Signal-Conditioning Electronics (3) Study of various sensors and transducers utilized for parameter measurement. Use of operational amplifier in signal-conditioning; design examples such as active filters, power amplifiers and function generators. Analysis of interfacing problems between transducer and signal-conditioner. Applications to environmental monitoring instrumentation. Prereq: 3120 or 3830.

4610 Analog-Digital Systems (3) Principles of analog computing components. Applied to analog computing to include problem set-up and scaling. Characteristics of analog multipliers, dividers and function generators are developed. Presents compar-ators, digital to analog conversion, and analog to digital conversion. Prereq: 3190 and 3830. 3 hrs including biweekly lab.


4630 Digital System Organization and Design (3) Consider system organization of digital systems including minicomputer and microprocessor architectures and comparisons. Characteristics of ALU and CPU structures, storage systems (RAM, ROM, and PROM building blocks), and Input/Output systems are developed. LSIs and LSI technology is introduced. Prereq: 3180. 3 hrs including biweekly lab.

4660 Bioelectric Instrumentation (3) Nature and origin of bioelectric potentials, transducers, amplifier requirements, recording systems and noise problems. Prereq: Senior standing.

4680 Electronic Power Amplifiers (3) Transistor, and vacuum-tube power amplifiers, distortion, thermal considerations; r.f. power amplifiers; regulators. Prereq: 3830. 3 hrs including biweekly lab.

4690 Communications Electronics (3) Oscillators, modulation and demodulation; basic communication systems. Prereq: 3830. 3 hrs including biweekly lab.

4700 Switching Circuits (3) Pulse amplification, gating circuits, multivibrators, wave shaping circuits, trigger circuits. Prereq: 3010, 3830. 3 hrs in-cluding biweekly lab.

4740 Integrated Circuits (3) Processing and fabrication of active and passive components for monolithic and hybrid circuits. Design of linear and digital and large scale integration. Prereq: 3820.

4750 Interactive Computer Graphics (3) Same as Computer Science 4750 and Geography 4750.


4800 Hardware-Software Interface in Minicomputer and Microprocessor System Design (3) Presents minicomputer and microprocessor interface design techniques. Hardware-software interaction and trade-offs. Priority interrupt structures are discussed and utilized. Telecommunications are developed. Prereq: oriented, contract course. Completion of two projects, one utilizing a minicomputer and the other a microcomputer, are minimal course requirements. Prereq: 3180.

4810 Diskette-Data Systems (3) Introduction to analysis and design of discrete data control systems using frequency domain techniques. Real-time digital filtering techniques; application of digital computers in closed-loop feedback systems.

4820 Introduction to Pattern Recognition (3) Role of pattern recognition within framework of artificial intelligence. Topics dealing with the design of learning and adaptive machines. Typical applications of pattern recognition to problems of practical significance. Computer simulation of elementary pattern recognition problems. Prereq: Either 3100 and Computer Science 3150, or Statistics 3450 and Computer Science 1510. (Same as Computer Science 4820.)

4830 Digital Image Processing (3) Principal methods of coding, storing, and processing images by means of digital computers. Computational algorithms for image operations. Prereq: 3100 and Computer Science 3150, or Statistics 3450 and Computer Science 1510. (Same as Computer Science 4830.)

4850 Small Computer Systems (3) Basic structure of small computer systems, input-output techniques, interrupt structures, peripheral devices, system software and assembly language programming. Course is project oriented. Prereq: Basic Engineering 1410, Computer Science 1510 or 3150 or consent of instructor. (Same as Computer Science 4850.)

4910-20-30 Special Electrical Engineering Problems (3, 3, 3) Problems in electrical engineering involving library and experimental research.

GRADUATE

5000 Thesis

5040-50-60 Electrical Engineering Research (3, 3, 3)

5070-80 Modern Transform Methods (3, 3)

5110 Introduction to Network Analysis (3)

5120 Network Synthesis and Design (3)

5130 Advanced Network Analysis (3)

5170 Bioengineering Systems I: Models, Systems Analysis and Simulation (3)
6270-80-80 Special Topics in Control Systems Theory (3, 3, 3)
6340-50-60 Special Topics in Quantum Electronics (3, 3, 3)
6500-10 Electrical Conduction in Gases and Plasma Materials (3, 3)
6610-20-30 Microwave Networks (3, 3, 3)
6650 Advanced Antenna Theory (3)
6660 Electromagnetic Diffraction and Scattering (3)
6710-20-30 Network Synthesis (3, 3, 3)
6750 Detection Theory (3)
6760 Coding Theory (3)
6800-10-20 Solid State Electronics (3, 3, 3)
6910-20-30 Advanced Sequential Machines and Automata Theory (3, 3, 3)

Engineering Administration
(See Graduate School.)

Engineering Science and Mechanics


Assistant Professor: J. Bitte*, Ph.D. Tennessee.

*Space Institute, Tullahoma

BACHELOR OF SCIENCE PROGRAM

The curriculum in engineering science will provide students an opportunity for education with breadth in engineering science, mathematics, and physical (or biological) science. Such a program will prepare students for a career in engineering development and research, professional education at the M.S. level, or additional graduate study leading to the master's or the doctoral degree. The curriculum will provide students a broad engineering education which permits a strong emphasis on engineering principles and basic science.

In the first two years students in the engineering science program study engineering, science, and mathematics. The engineering science program is the upper-division year, and it is essentially an elective curriculum in which the special interests of students can be met which cannot be accommodated in other programs. Examples of special interest elective groups are presently available in the engineering science program are biomedical engineering, engineering mechanics, engineering analysis and synthesis, environmental sciences, and engineering materials. Other elective groups are currently being developed and will be available in the future.

The biomedical engineering elective group provides the basic background for an engineer to contribute to the fields of biology and medicine in such technical areas as the design of research and diagnostic equipment, the development of artificial organs, and the application of the engineering sciences to further the basic understanding of biological systems. With some modifications, the program can emphasize other areas such as the use of computer systems to automate hospital operations, to analyze medical data, and to contribute to the broad area of health care delivery systems. Interested and qualified students may choose to use this program as a background for graduate study in engineering or the life sciences. The program includes the courses required for entrance into most medical schools, including The University of Tennessee Center for the Health Sciences in Memphis.

The engineering mechanics elective group focuses on analytical and experimental methods used in investigating the interaction of forces and matter. It is designed especially to develop engineers capable of engaging in research and development in industrial and governmental research laboratories. Because such preparation involves emphasis on the link between the basic sciences and engineering fundamentals, the engineering mechanics elective group provides a good theoretical background for students wishing to pursue engineering graduate studies.

The engineering analysis and synthesis elective group affords a concentration on the application of numerical techniques as numerical analysis and simulation for the solution of practical engineering problems. As such, heavy emphasis is placed on the use of digital computing.

The environmental sciences elective group introduces the student to some of the areas of knowledge and to some of the basic skills involved in engineering efforts aimed at solving environmental and ecological problems. This program gives the necessary background in both stress/structural analysis a higher level of competence in this specialty during professional practice or through formal graduate study.

The engineering materials elective group provides background in the use of materials in the solution of engineering problems. This includes the selection of the proper materials to support the anticipated loads and consideration of the environmental conditions that are expected to exist during the design life of the system. There is a special need in industry for individuals with background in